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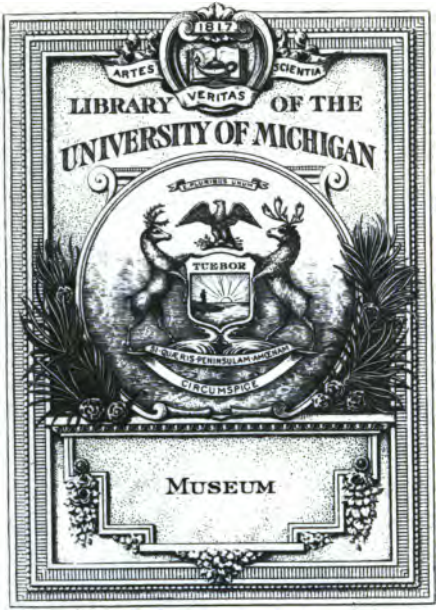

BRITISH INDUSTRIES.

EDITED BY

G. PHILLIPS BEVAN, F.G.S.

With Mr. Young's compliments.

SEA FISHERIES,

BY

E. W. H. HOLDSWORTH,

F.L.S., F.Z.S., ETC.

SALMON FISHERIES,

BY

ARCHIBALD YOUNG,

COMMISSIONER OF SCOTCH SALMON FISHERIES.

LONDON:

EDWARD STANFORD, 55, CHARING CROSS, S.W.

1877.

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BRITISH INDUSTRIES.

SEA FISHERIES.

By E. W. H. Holdsworth, F.L.S., F.Z.S.

The position occupied by the Sea Fisheries among the industries of the United Kingdom is one of peculiar importance. Their value in adding largely to the food resources of the country is of course very great; but it is scarcely less important, that they cannot be carried on without contributing to the development of particular trades and manufactures, all of which are of essential consequence to a maritime people like our own; and that they are a regular means of training a large number of men and boys to the endurance of hardships and dangers, which are unavoidable elements in a seafaring life. And when we consider the extent of our coast line, and that at even every little village on it, some of the population, and frequently many of them, are fishermen, we can hardly doubt but that the self-reliance and forethought induced in them by the necessities of their vocation, must have some influence for good on the national character.

The present condition of our sea fisheries may be

regarded as satisfactory. The increase in the aggregate tonnage of the larger fishing boats in England and Scotland; the marked improvement in the style of craft used; the larger supply of fish generally to the markets, consequent on the greater enterprise of the fishermen; and notwithstanding the larger supply, the better prices the fishermen themselves receive for their captures, point alike to the increased demand for fish throughout the country, and to the confidence of the fishermen in the unfailing numbers of fish in the sea. In no class of persons perhaps is there, however, more frequent complaining or grumbling about bad times than among fishermen, if they are asked how their fishing is going on. The uncertainty about fishing seems generally present in their minds, and they cannot readily forget the amount of money they have laid out on boats or nets, and that bad weather, or some other cause not easy of explanation, may possibly prevent their having a good return for their outlay. There are often also antagonistic feelings between line and net fishermen, and between drift fishermen and trawlers; and when one method of fishing is at all interfered with by another—when trawlers occasionally work over ground where line-fishing has been carried on, and thus an innovation on the modes of fishing practised in a particular district has been made, then complaints are heard of the fish having been almost all driven away from the coast, and comparisons are made of the present bad times with some particular season when, on inquiry being made, it is probably found that fish were unusually abundant. There is no

doubt that our fisheries fluctuate a good deal from year to year; and it is frequently the case, that they may be good on one part of the coast when they are bad on another. The important herring fishery on the coasts of Scotland is a remarkable example of this, and that it is so, is familiar to most persons concerned in those fisheries. Thus, it not unfrequently happens that when the fishery on the east side is particularly successful, a scarcity occurs on the west coast; or herrings are sometimes abundant on the west coast, when the fishery on the eastern side has been generally unsuccessful. Again, in some years the fish are equally abundant or scarce on both coasts.

These fluctuations are found in even small districts of a line of coast, or, one part of a season may be good and another bad in the same locality. Precisely similar variations occur on all the coasts of the British Islands, and with all kinds of fishes. Weather is an important element in the question; but the real explanation of these fluctuations cannot be given until we know a great deal more of the habits of sea fish, and of what influences their migrations from one part of the coast to another, and their movements towards the shore, or the reverse, than we do at present. On these very important questions the fishermen can only offer crude opinions, although in very many cases their ideas are expressed with the fullest confidence in their being strictly founded on facts. The fisherman's knowledge may, indeed, be commonly summed up in the fact, that certain fishes frequent particular localities at some definite season. They fish for them there ac-

cordingly; and, as they say, if they have fine weather and good luck, they catch them.

The changes which have taken place in the fishing trade within little more than a generation, and even in recent years, are very remarkable. Formerly, a great deal of the fishing on our coast was carried on in small open boats at a very short distance from the land, and what each boat brought in was readily sold in the place, or was offered at the houses in the neighbourhood by the fishermen's wives, whose regular business it was to dispose to the best advantage the varied produce of her husband's morning's work. Now, the whole system of selling fish has been completely changed on a very large proportion of our coasts. Markets for the sale of fish have been opened up in all parts of the country, and such a stimulus has been given to fishing as is little appreciated by many who might be supposed to understand something of what is going on around them.

The great agent in the change which has taken place is mainly the extension of railways throughout the length and breadth of the land. The cost of carrying fish a hundred miles inland is now of trifling importance, and railway companies whose lines run along the coast, or extend inland from places where fish is likely to be landed, have had the good sense to give every facility to the increase of fish-carrying, seeing the prospect there was of establishing a regular and profitable traffic. The means thus afforded of disposing of any quantity of fish, whilst yet only a few hours out of the water, and in a condition which not many

years ago would in inland towns have been thought simply impossible, stirred up the fishermen to work with corresponding energy. The change is hardly less marked because it has been to some extent gradual, for wherever a line of railway has been opened along the coast, an increase of fishing has taken place in connection with it, the fishermen have obtained better prices for what they brought in every day, and this has given a stimulus to their work which was previously unknown to them. One curious effect resulted from the increase of fishing at places within easy reach of a line of railway, which for a long time was not generally understood. The larger the supply of fish landed at any of these fortunate places, and the more important such places became as fishing stations, the more difficult it was for the people of the locality to procure fish. A cry arose that fish were becoming scarce, and the more numerous were the fishing boats, the smaller, it was said, was the catch of fish by each boat. It is difficult to believe that persons who saw tons of fish daily sent away by the trains where only hundredweights were landed a few years before, could have so persistently shut their eyes to the facts. Yet such was the case on many parts of the coast. Now, every fisherman complains if he has no railway within easy reach, for he knows that his market must depend on his immediate neighbourhood, whilst perhaps only a few miles off, every fish that is brought on shore is eagerly bought up to be sent away by train to inland towns, where the supply has not yet reached the limits of the ever-growing demand. For a long series of

years the coast population had almost a monopoly of the fish that was brought on shore. A few highly-favoured people in the country occasionally had a small supply of fish sent them by the coaches, but to the vast majority of the inland population fresh fish was a thing utterly unknown. Now the whole system is reversed. Wholesale dealers attend the arrival of the boats at all the fishing stations of the slightest consequence. There are regular agents of the Billingsgate salesmen always on the look-out for anything that is marketable, either to send to their principals in London, or, under their instructions, to forward their purchases to fishmongers at the inland towns. It will, therefore, be readily understood that those persons who formerly had their choice of soles, cod or other kinds of fish, are in these times frequently obliged to send to some large market inland, and perhaps pay a high price for such fish as used to be regularly brought for sale to their own doors.

There are unfortunately no direct means of ascertaining, even approximately, the quantity of fish annually brought to market. But I may refer to some of the circumstances which show that the supply must have very largely increased in recent years. What has chiefly led to the increase of the sea fisheries is, as before mentioned, the universal extension of railways wherever it has been practicable to construct them, and there has been a reasonable prospect of their paying. In former years, when railways were in their infancy, most of the fish sold at Billingsgate was brought thither by water carriage. It was the one

great market, and London was the first place to have her wants supplied. At that time the Billingsgate salesmen forwarded to the country such fish as could be spared and was likely to reach its destination in proper order. Even after railways had been considerably extended, they were used more for distributing the fish to the country from London than for bringing it thither; for, excepting Yarmouth, the present great North Sea stations had not then attained much importance, and both trawlers and deep-sea liners mostly hailed from the Thames. As the coast lines of railway became completed, their convenience for sending the fish to London was soon recognized, and their fish traffic rapidly increased; for London was still the great wholesale market, and the salesmen supplied the country fishmongers according to the orders received by post. But as time went on, and the electric telegraph became generally established throughout the country, a great change took place in the mode of doing business. The agents at the different fishing stations received notices by "wire" from their principals in London of the country orders to be executed, and the fish was forwarded accordingly direct from the place where it was landed, thus saving both time and expense. This is the present practice to a very large extent; but there are many parts of England which can still be most conveniently supplied from Billingsgate. The fish business done by "wire" is, however, considerable, and telegraph charges have become an important item in the accounts of the salesman at the present day.

Anyone who has at all looked into the question of the daily supply of fish from our coasts, must be well aware that these direct consignments to inland markets afford the most positive contradiction to the arguments which the systematic denouncers of free fishing in the sea have so frequently brought forward. For, notwithstanding the literally enormous quantity of fish which is thus sent to inland towns without coming at all to Billingsgate, that great market has been so overburdened with the supply sent there for some years past, and the various narrow streets and lanes leading to it have been so choked daily with the number of railway waggons waiting to deliver their loads, that the Corporation of London have recently taken the subject in hand, and at very great expense are doubling the size of this great metropolitan fish market. Yet where, twenty or thirty years ago, fish was almost unknown in the country, there is now a regular supply at prices very commonly lower than those charged by the West End fishmongers in London.

The railways have thus revolutionised the trade in fish, more so, undoubtedly, in England, than in either Scotland or Ireland; but the railway system has also told very largely, indeed, in the sister kingdoms, and the recent extensions on both sides of Scotland have led to increased fishing on many parts of those coasts. Next to railways as a means of facilitating the distribution of fish to all parts of the country, and thus stimulating the fishermen to increased enterprise and energy in their vocation, I must mention the very

important article of ice, now a necessary part of the fit-out of almost all our deep-sea trawlers, those which work as a rule far out of sight of land. The idea of using ice for the preservation of fish, was first put into a practicable shape by the late Mr. Samuel Hewett, to whose credit it may be stated that, beginning life as a boy on board a trawl-smack, he lived to see a fleet of fifty or sixty vessels in regular work for himself and family, and under his own supervision, to almost the last days of his life.

His is one more example of how what may be called a rough, unlettered man succeeded, by hard work and constant attention to his business, in doing good, not only to himself, but to an extent he perhaps little anticipated, to the community at large.

At the present moment no less than 25,000 tons of ice are annually imported from Norway into Hull, one of the great North Sea trawling stations, for the sole purpose of being used for packing the fish in, either on board the fishing smacks, or when sending it off by railway. Hull is only one of three very large trawling stations on the north-east coast of England, and the increase in the quantity of fish, which, by the use of ice, is now delivered in good condition at the various markets of the country, is almost incalculable. It may be said with good reason that, excluding herrings, pilchards, and sprats, a very large proportion of the fish now caught on the English coasts is put into ice as soon as taken out of the water; it is brought on shore, sometimes after several days, and sold in the wholesale markets; it is then repacked in ice and for-

warded to Billingsgate, and other large markets, where it is purchased by the fishmongers, who have a stock of ice at home ready to receive it; and there it remains, if properly taken care of, till it is wanted, sufficient only to make an attractive display being laid out at one time for sale. The fishmonger is no longer disquieted by any doubts about the fish which is unsold to-day being sound and presentable to-morrow; if his cellar be in proper order, there need be no cause for anxiety. The use of ice, of course, adds to his expenses, which he makes the public pay for, but it is a real and great saving to him in fish; were it not so, we may be quite sure he would have little to do with it. The wholesale dealers benefit by the use of ice, only so far as it enables a larger quantity of fish to come into their hands for sale. They cannot lay by what is not disposed of. Overburdened Billingsgate must be cleared out to-day, or there will be no room for what will certainly be brought there to-morrow; and if the supply be more than is required by regular London and country customers, the rest must be got rid of at a price which attracts another class of buyers—the costermongers.

There is always a very large quantity of "offal" fish, such descriptions as are not included under the trade term of "prime," purchased by these itinerant dealers, and their business lies chiefly at the east end of the town, in poor districts, and in back streets generally. Plaice especially are in request by their customers, and notwithstanding the immense supply of this fish daily sent to market by the trawlers, there appears to

be always a sale for it. But it not unfrequently happens that there is a glut of some of the better kinds of fish, and, as we have said, the market must be cleared; then the costermongers may be seen going with their barrows into more select neighbourhoods than they usually visit, and hawking soles, haddocks, and whiting, fresh from the market, as well as their more general stock of inferior kinds. And the fish they are thus enabled to sell at low prices is excellent, while the fashionable world are paying fashionable rates for such fish as the ordinary purveyors may like to send them fresh from the ice in their cellars.

It may be a question whether fish kept in ice will long retain its flavour and firmness, but I believe there is no doubt of its being wholesome and nutritious, if used immediately after removal from the ice-box. There are very few kinds of fish which would not taste better, if eaten as soon as they are caught; but such delicacies are now seldom to be procured, if a railway be within reach of the place where they are landed. There is no help for it, however; for, were ice not in such general use by the fish dealers and many of the fishermen, a much smaller supply of fish would be in a saleable condition when it reached the market, and the quantity sent would be materially diminished; at the same time the existing facilities of transport inland direct from the fishing stations would, as at present, certainly lead to a great demand for it in the country; competition between the buyers for the fish likely to bear the carriage to distant markets would result in prices which would cut off hundreds of

thousands of would-be consumers; and although fish would then be supplied in most cases in a really fresher and better condition than is now often the case, it would be only a luxury in very many houses where it is now an article of daily consumption.

Thus the railway system has created an immense increase in the demand for fish, and the use of ice has contributed materially to meet it, by preserving in a wholesome condition an enormous quantity of fish which would otherwise have been unsaleable. The result of the combination of these two influences has been a considerable development of our fisheries, and consequently a great increase in the number of boats and men employed in the deep-sea fishing. Yet the supply has not hitherto kept pace with the unfailing demand for fish among the increasing population of this country; and competition between the general dealers has resulted in the fishermen, as a rule, now obtaining much better prices than formerly for the produce of their labour. That fishing is now a generally profitable occupation, taking one season with another, is shown not only by the fisherman being able to provide for the increased expenses of his living and the greater cost of everything required in his occupation, but by the large number of new and better class of fishing boats which are taking the place of such as were in general use only a few years ago. With rare exceptions, all this money invested in fishing boats has been the legitimate produce of fishing.

The increase in the size of the fishing boats has not been confined to any particular part of the coast, or to

those employed in any one kind of fishery. Under the Sea Fisheries Act, 1868, all boats or vessels belonging to the United Kingdom, of whatever size, and however propelled or navigated, which are employed in sea fishing for the purposes of sale, are obliged to be registered at the Custom House, and to have their port letter and number marked in a conspicuous manner on their bows, and, where it can be done, on their principal sail. For the better distinguishing of harbour, coast, and deep-sea fishing boats, they are divided into three classes, as follows:

1st Class: Boats of fifteen tons burthen, and upwards.

2nd Class: Boats of less than fifteen tons burthen, navigated otherwise than by oars only.

3rd Class: Boats navigated by oars only.

The registering officer, however, has a discretion allowed him to place in the third, instead of the second class, any small fishing boat in which a sail is occasionally used. This provision is very necessary in the case of the Irish fishing boats, as a large proportion of them are very small, and being used for many purposes besides fishing, a sail of some kind is often needed. This classification of our fishing boats is quite an arbitrary one; and, without local information, it is impossible for anyone to ascertain for what purpose the boats in any of the classes are used, or whether there has been an increase or decrease in any particular mode of fishing. For instance, the boats in the first class, ranging from fifteen tons upwards, include all the deep-sea trawlers, which at the present

moment average about fifty-five tons, many of the new ones being as much as seventy or eighty tons; oyster smacks are also included; and owing to the recent increase of size in the Scottish drift-fishing boats, a majority of them will also rank as first-class boats instead of in the second class, according to former returns. Many of the Cornish, and almost all the Yarmouth drift boats, will also go in the first class. Again, in the second class every description of fishing boat, except such as is used for sean-fishing, is included, and consequently no idea can be formed from the return of the state of any one fishery. In the third class there should be very few boats except those specially used for sean-fishing and harbour oyster dredging; but the discretionary power of the registering officer must often lead him to put numerous small line, crab and lobster fishing boats in this class, although each of them carries a sail whenever it can be used with advantage, and should accordingly go into the second class. It will, therefore, be seen that one of the objects sought for in the registration of fishing boats, that of showing approximately the number and size of the boats engaged in each kind of fishery, and, therefrom, the flourishing condition or otherwise of that fishery, is entirely defeated by the absence of a good arrangement of the information collected by the Customs, and classified by the Registrar-General of Shipping and Seamen under the direction of the Board of Trade, by whom it is published. It is true that in the second and third classes certain details are given, evidently with the best intention,

but they really only add to the confusion, thus: the aggregate tonnage of some of the boats in each of these classes at particular ports is given, and the remainder are arranged in different groups, according to their length of keel, many of the latter being evidently much larger boats than those whose size is recorded by tonnage. There are certain things broadly indicated, however, by these official returns, imperfect as they are, in respect to the second and third classes, and these are that there has been a great increase in the number and tonnage of the first-class boats, and a marked decrease in the number of the second and third class fishing boats. And, from information that I have obtained since the publication of the last official return, I am enabled to say that the change is still going on in the same direction. The larger size is especially noticeable in the case of the North Sea trawlers, and the increase in the number of trawlers at almost every station is very remarkable. Every yard in which such vessels are built (and fishing craft of this kind are usually constructed only at places where their requirements are well understood) is full of work, and orders are waiting their turn for execution. I have reason to believe that there are now sufficient orders given for new vessels of the largest size, known as trawl-boats, to occupy two years in their completion. The cost of trawl-boats, owing to their larger size and the greater expense of all the materials used in their construction, has increased within the last fifteen years from 700*l.* or 800*l.* to upwards of 1200*l.* each.

Trawlers, however, are not the only fishing boats which have increased in size and cost. A very remarkable change has in recent years been made in the Scotch fishing boats, especially those on the east coast, and much of the danger to which they were so frequently exposed during the heavy gales from the east and north-east is now guarded against by using decked fishing boats instead of the entirely open boats which, for generations past, had been almost the only ones employed there. The annual loss of life among these hardy fishermen from their boats being swamped, either when overtaken by the sudden gales in the treacherous North Sea, or whilst running through the broken water in attempting to enter their little fishing harbours, was for years insufficient to induce them to give up what their fathers had been accustomed to work with. But a more sensible course has recently been pursued; and an alteration from undecked to decked boats having been made in some few instances, the advantage of the change became so evident, not only in the greater safety of the fishermen, but also in their being able to go out and carry on profitable fishing in weather which would have formerly obliged them to remain on shore, that decked boats rapidly grew in favour, and now most of the boats at the important stations are of that description, and they are added to every year. With the change of style there has also been an increase in size, bringing a great number of them within the first class; the second-class boats have accordingly considerably diminished in number. Not less remarkable than the change from

undecked to decked boats has been the alteration in the masting of very many of the Scotch boats. Anyone who had an opportunity a few years ago of comparing the Scotch with the English drift-boats, must have noticed the peculiar rig of the former in the general absence of a mizen-lug, and the practice of carrying a large main-lug and a fore-lug. The inconvenience of the necessary arrangements in a decked boat for lowering the mainmast, as well as the foremast, when fishing, which is so desirable as to be almost absolutely requisite, has led to the adoption in these boats of the universal rig of drift-boats in England, namely, a very large fore-lug and a mizen; thus the mainmast is altogether got rid of, and the advantage is gained of having the after sail in a position where it has increased power, which is especially useful on a wind, or when the boat is working its way in or out of harbour, while at the same time giving more room in the boat.

I have hitherto said very little of the Irish fisheries. They offer a painful contrast to those of England or Scotland; not, however, from any general scarcity of fish, but unfortunately owing to the annual decline in the number of persons who devote their energies to the necessary work. Emigration, improvidence—with its natural result, poverty—distance from markets in some districts, objections and obstructions to unaccustomed methods of fishing in others, idleness after successful work, and, I fear, an inclination to spend money in drink rather than in materials for fishing, have in one part or other of Ireland

gradually reduced the fisheries to their present low condition. With signs of improvement in recent years on some parts of the coast, there has been an increased falling off in others, resulting every year in a decrease in the total number of both boats and fishermen. I have been obliged, therefore, to leave the Irish fisheries out of the question when speaking generally of the condition of the sea fisheries of the United Kingdom; but I shall have occasion to refer to them more particularly, when I notice the several Irish districts in which fisheries of any importance are now carried on.

The following table, compiled from the Annual Returns published by the Board of Trade, shows the number and aggregate tonnage of the first class, and the number of the second and third class fishing boats on the register in the United Kingdom in the years 1872, 1873, 1874, and 1875. A fair idea of the average size of the first-class boats may be gained from this table; but it is impossible to estimate that of the second and third class boats from these returns, and there is some doubt about the accuracy of the numbers.

Total number of fishing boats registered in the United Kingdom in the years 1872, 1873, 1874, and 1875, arranged according to their classes:

Year.	First Class.		Second Class.	Third Class.
	Boats.	Tonnage.	Boats.	Boats.
1872	5,284	145,387	25,452	9,810
1873	5,510	152,139	24,143	8,465
1874	5,718	160,041	23,130	7,929
1875	5,934	164,441	21,933	7,375

It should be remembered that the boats in the first class range from 15 to over 80 tons, and those in the second and third classes together include everything under 15 tons down to the smallest boat, each of these two classes containing fishing boats of both large and small size, although the third class consists mainly of the smallest kinds used for harbour fishing.

I now propose to give some account of the several methods of fishing commonly carried on in our seas. To enable the modes of working to be fairly understood, it will be necessary to enter somewhat into details; but I shall endeavour to avoid technicalities as much as possible, so as to make my descriptions and explanations reasonably intelligible.

The principal methods of fishing are those by trawl-nets, drift-nets, line and sean-nets.

TRAWLING.

THERE is no method of fishing which is of greater importance in relation to the supply of fish to our markets than trawling; for it is not only the means of providing us with the essentially "prime" fish, such as turbot, brill, and soles, but also with immense numbers of plaice and haddock, besides other kinds of fish which are in great demand by the poorer classes of this country. It is also worthy of notice that trawling is carried on throughout the year; and,

as a good deal of wind is necessary for towing the trawl-net over the ground, its most effective work is done during the winter, when the weather is often unsuitable for other kinds of deep-sea fishing. The name of the net is evidently derived from the manner in which it is worked, rather than from any peculiarity in the net itself; the trawl, such as I am now speaking of, is a flattened bag-net, commonly about 100 feet long, or perhaps rather more, and it is towed, trailed, or trawled along the bottom in such a manner, as to catch those fish especially which naturally keep close to or upon the ground.

It is very desirable that the name "trawl" should be restricted to the net now under notice; as this mode of fishing is everywhere, except in Scotland, or most parts of it, known by the name of "trawling." In many parts of Scotland, however, the sean, used particularly for catching herrings, and thrown out or "shot" in a semicircle, is also called a "trawl," because, we may suppose, the two ends of the net are dragged or trailed towards some place either on shore or to an anchored boat, until the whole net is gathered in. Much confusion has arisen among the numerous persons who have written on the sea fisheries, owing to the different applications of the term "trawl"; it is therefore important to remember that the herring trawl in Scotland is nothing more than the net which is universally known in England as the sean, which will be hereafter described; and that the true trawl, or "beam-trawl," as it is very frequently called, is a flattened bag-net towed over the ground, for the most

part in deep water, at a distance of very many miles from the shore.

I have been unable to ascertain anything of the origin of trawling; it may have been a common mode of fishing in the bays and shallow waters along our coasts during the last century, but good evidence of such having been the case is wanting; and it appears quite certain that at the beginning of the present century, the trawl vessels were few and of very small size. No method of fishing, however, has so rapidly developed as this, and the increase has been especially marked during the last fifteen or twenty years. At the present moment there is more capital embarked in trawling than there has ever been since that mode of fishing came into use; and owing to the demand for fish in all parts of the country, which has sprung up in recent years in consequence of the facilities offered by the railways for its transit to inland markets, prices have increased to some extent, and, we are glad to say, the fishermen now obtain a larger share than formerly of what the consumer is called upon to pay.

Trawl fishing is carried on to a large extent by the French, Belgian, and Dutch fishermen; and on the Spanish coast a net of the same kind, but without a beam, and requiring two vessels instead of one to work it, has been in use for a very long time.

The principal stations in England for deep-sea trawling are Plymouth, Brixham, Dover, and Ramsgate, in the English Channel; Barking, Lowestoft, Yarmouth, Grimsby, Hull, and Scarborough, on the east coast; Fleetwood, Whitehaven, and Liverpool, on

the west; and Carnarvon and Tenby, on the coast of Wales.

There has been very little 'beam trawling on the Scottish coast until within the last very few years; but since the extension of railways on the western side, trawling has been successfully worked on a limited extent of coast, but almost entirely by English fishermen.

In Ireland the trawling stations for large vessels are Dublin, Waterford, Dingle, and Galway.

In-shore trawling is carried on by small craft on several parts of the coasts of the three countries, but far less in Scotland than elsewhere.

The Beam-trawl.

I will now give some account of the construction of the trawl, and of the manner in which it is worked.

The beam-trawl may be simply described as a triangular, flat, purse-shaped net, with its wide mouth kept extended by a horizontal wooden spar called the "beam," which is raised a short distance from the ground by two iron supports or "heads"; the upper part of the mouth of the net being fastened to the beam, and the under portion or lower edge of the opening dragging on the ground as the net is towed over the bottom.

I will take one of the Brixham trawls as a fair example of this kind of net, and the details I shall now give are taken from such nets as are in ordinary use in this, as it is believed to be, original trawling station.

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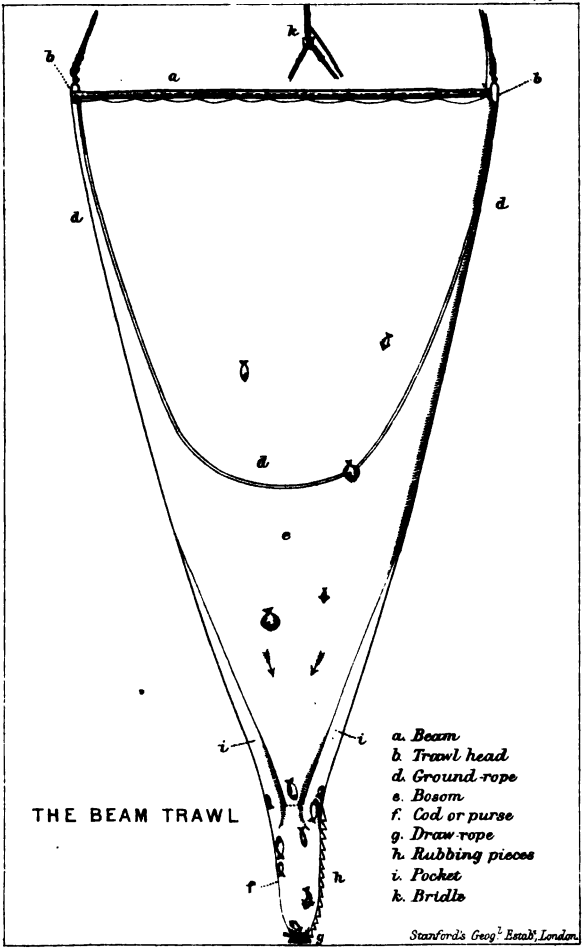
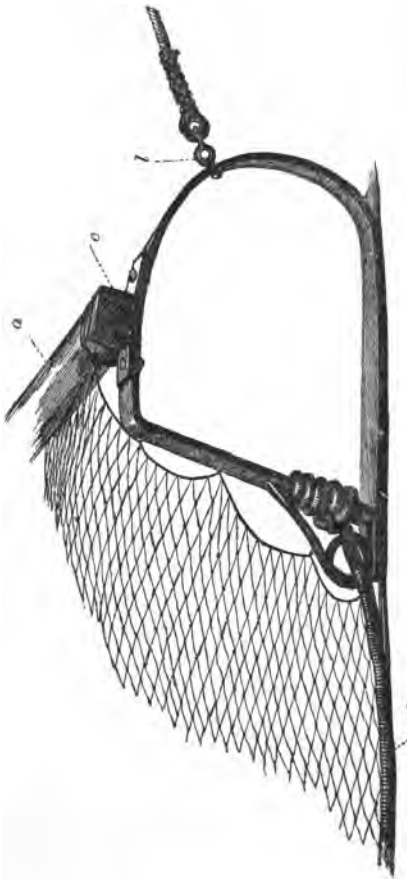


The beam of course varies in length according to the size of the net, and depends to some extent also on the length and power of the vessel which has to work it. In the large "smacks," as the trawl-boats have long been called, the beam ranges from 36 to 50 feet in length. Elm is generally preferred for it, selected if possible from timber grown of the proper thickness, that the natural strength of the wood may not be lessened by any more trimming or chipping than is absolutely necessary. If the required length and thickness cannot be obtained in one piece, two or even three pieces are scarfed together, and the joints are secured by iron bands. Appearance here is not of so much consequence as strength and toughness, to resist the strain to which the beam is commonly exposed when the net is at work. I have mentioned that the length of the trawl-beam has some relation to the length of the vessel; the explanation of this is, that when the trawl is being hoisted in, the first part that comes on board is the large heavy beam; and it is important that it should be secured as quickly as possible without being actually taken into the vessel, which would commonly be a work of difficulty, and sometimes of danger, seeing that in most cases the vessel is rolling and pitching about far out at sea, when this part of the work has to be done. The beam is therefore made of such a length as to reach from the extreme end of the stern to just in front of the aftermost shroud, nearly opposite the mast. When, therefore, the beam is hoisted up alongside, one end of it is made fast by a rope which comes in over the stern and

secures it there, whilst the other end is fastened between two of the shrouds, the beam itself resting on the top of the bulwark.

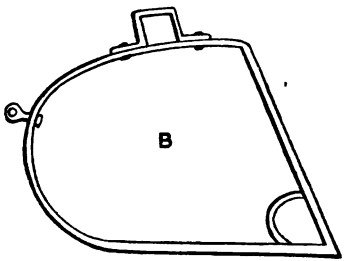
Fig. 1.



One end of Trawl-beam (*a*) fitting into socket (*c*) of Trawl-head or iron, with Ground-rope (*d*) and fastening of Bridle (*f*).

The use of the beam is to extend the mouth of the net; but in order to allow room for the fish to enter, the beam, and with it the back of the net, must be raised a certain distance from the ground. For this purpose, the beam is fastened at each end to the top of an iron frame, shaped something like an irregularly formed stirrup, which is fitted to it at right angles by

Fig. 2.

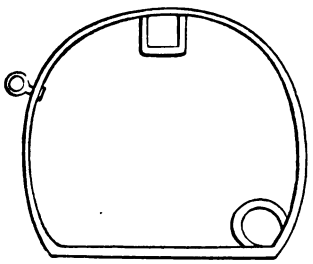


Trawl-head.

a square socket at the top. By these "heads or irons" the beam is raised nearly three feet from the ground, and, contrary to the very popular idea, never touches the bottom. It could do so, only if the trawl were to reach the ground with its back undermost, and then the mouth of the net would close and no fish could enter. The lower part of the trawl-head or iron is straight and flat, just like the corresponding part of a stirrup. It is called the "shoe," and is the part which slides over the ground, as the trawl-net and beam are towed along. There is some slight variation in the shape of the irons used on different parts of the coast, but

the commonest forms are those represented in Figs. 1, 2, and, as will be seen, are rounded in front and angular behind. One kind known as the Barking pattern, and used by the Barking and many of the Yarmouth trawlers, is quite symmetrical and stirrup-like in shape, but it is not approved of by the great body of the trawlers.

Fig. 3.



Barking Trawl-head.

The trawl itself is, as I have before mentioned, a triangular purse-shaped net, consisting of several portions, each having its own name. An old-fashioned bed watch-pocket laid on its face will give a fair idea of a trawl, when in a position for working. What is then its upper surface is called the "back," and the under portion the "belly." The straight front edge of the back, or "square" of the net is fastened to the beam, and is therefore raised two or three feet from the ground. The corresponding lower part of the net, however, is cut away in such a manner, that the margin of the net forms a deep curve extending from the foot of one trawl-iron to the other, and therefore

close to the ground; the centre of the curve or "bosom" being at a considerable distance behind the beam and front of the net. The usual rule in English trawls is, for the distance between the beam and the centre of the curve to be about the same as the length of the beam. In French trawls this distance is generally much less; but in all cases there is a considerable space of ground over which the beam and back of the net must pass, when the trawl is at work, before the fish lying under them on the bottom are disturbed by the lower part of the net.

This curved lower margin of the mouth of the net is fastened to and protected by the "ground-rope" (Fig. 1, *d*), which is made of an old hawser "rounded" or covered with small rope to keep it from chafing, and to make it heavier. Its purpose is to protect the edge of the net, and especially to keep it on the ground so as to sweep the bottom and disturb the fish, which, passing over it, then find their way into the narrow closed extremity of the trawl. The ends of the ground-rope are fastened on each side by a few turns round the back of the trawl-iron, just above the shoe, and the rope rests on the ground throughout its entire curve. The fish have therefore no chance of escape at either the sides or bosom of the net, and their only outlet, when once the beam has passed over them, is in front, so that they must dart forward in the direction in which the net is moving, to enable them to get clear of it. The ground-rope is made of old material, so that it may break, in case of getting foul of rocks or any chance obstruction which may be

met with on the generally smooth bottom where only the trawl can be worked with advantage. If in such a contingency the rope were so strong and good as not to break, there would be serious danger of the tow-rope parting, and then the whole apparatus might be lost; but the ground-rope giving way, enables the net to be cleared, with the probability of no more damage to it than the broken rope and perhaps some torn netting.

The remaining part of the trawl, that is, the portion extending from the bosom to the extreme end, forms a complete bag, and gradually diminishes in breadth until within about ten feet of the end. This last part of it is of uniform size, and is called the "cod" or "purse"; it is here that the fish which enter the net are mostly collected, and they are prevented escaping by the end of this bag or purse being closed by a draw-rope when the net is in use. As soon, however, as all the net is hoisted in, the draw-rope is cast off, and the fish fall out on the deck of the vessel. The under part of this cod or purse is exposed to a good deal of wear from the weight of the fish collected within it; and to protect it as much as possible, layers of netting, called "rubbing-pieces" are laced across it, one layer slightly overlapping the next one. In French trawls, a stout hide is frequently fastened under this part of the net for the same purpose.

I now come to the means which are adopted to prevent the escape of the fishes which have found their way to the cod or purse of the net.

The net has been described as tapering away until

the purse is reached; it is at this point the entrance to the pockets is placed, and the arrangements are such, that those fish which try to escape by returning along the sides of the purse, are pretty sure to get into the pockets, and there, the more they try to press forwards, the more tightly they become packed. The pockets are not separate parts of the net, but are made by simply lacing together the upper and under parts of the trawl for a length of about sixteen feet on each side, in a line from the outer edge of the bag downwards and inwards to its small end and the commencement of the purse or cod. The lower portion of the main body of the net is thus separated into three spaces of nearly equal breadth; the central space is that through which all the fish pass which enter the purse; it allows a free passage in that direction, but a valve or curtain of netting, called the "flapper," prevents their return. On each side of, and beyond, the flapper, however, is the entrance to a pocket; and the fish, being unable to return through the passage closed by the flapper, make their way into the pockets and press on, till at last the gradual narrowing of the space stops their further progress in that direction. To understand clearly the facilities offered to the fish to enter the pockets, it is necessary to remember, that the trawl, when at work, is towed along with just sufficient force to expand the net by the resistance of the water. But this resistance directly acts only on the interior of the body of the net between the pockets, and then on the purse; it does not at first expand the pockets, but rather tends to flatten them,

because they are virtually outside the cavity of the net, and their openings are at the farther end of it. The water, however, which has expanded the body of the net, then makes its way through the flapper or valve, and enters the purse, which, being made with a much smaller mesh than the rest of the net, offers so much resistance, that it cannot readily escape in that direction; return currents are consequently formed along the sides, and these currents open the mouths of the pockets, which face the purse or small end of the net; and the fish, in their efforts to escape, finding these openings, follow the course of the pockets, until they are unable to proceed any further. The whole of the net is therefore fully expanded, but it is so by the pressure of the water in one direction through the middle, and in the opposite one at the sides.

In an ordinary deep-sea trawl, the meshes are of four sizes, diminishing from 4 inches square near the mouth to 1½ inch at the cod or small end; and the twine used for the under part of the net is usually a size larger than that for the back.

A large trawl such as has now been described is therefore an immense bag-net, frequently 50 feet wide at the mouth, and upwards of 100 feet in length. It is towed over the ground by the "trawl-warp," usually a 6-inch rope, 150 fathoms long, and made up of two lengths of 75 fathoms each, spliced together. The end of this warp is shackled to two other pieces, each 15 fathoms long, and called the "spans or bridles," which lead one to each end of the beam, and are

shackled to swivel-bolts in the front of the head-irons.

The vessels used for trawling have long been known as "smacks" from their smack or cutter rig. Forty or fifty years ago, they were of comparatively small size, ranging from about twenty to thirty-six tons. They were stoutly built craft, able to hold their own in almost any weather, but not remarkable for fast sailing. Sea-going qualities were especially necessary in vessels which had to work at all times, and often at some distance from land. The improvements in modern shipbuilding were, however, not lost sight of; and the great and increasing demand for fish has led to the construction of larger trawlers, capable of working much heavier nets, and with finer proportions, so as to give greatly increased speed, that the fish might be brought to market with as little delay as possible. The large mainsail in these smacks has great driving power, and therefore is a very important sail; but the increase in the size of the vessels, especially during the last few years—many of them now being as much as seventy or eighty tons—has made a change of rig desirable, so as to be able to work them economically. The larger mainsail in these new vessels would require additional hands to look after it in bad weather, when a heavy boom is likely to strain everything to the utmost. This sail has accordingly been reduced in size, and a mizen mast has been added, on which a small gaff-sail is carried. The new vessels are also built of greater proportionate length than formerly, so that, with the change in rig,

the great pressure of the sails is brought lower, and the vessels are easier in a seaway, and more readily handled. These vessels are what is called "ketch-rigged," and the change is generally adopted in the new trawlers at the North Sea stations and at Brixham. One important advantage in the increased size of these fishing vessels, is the additional room provided on board. This adds not only to the comfort of the crew, but enables a considerable quantity of ice to be carried, now a necessary condition of North Sea trawling. Stowage is also provided for the produce of many days' fishing, when, as is the rule, except during the calm summer months, the North Sea trawlers stay out for several days at a time, and bring home their own fish instead of sending it in by carriers.

The cost of trawl smacks has greatly increased of late years, not only on account of their larger size, but because of the higher price that has now to be paid for everything connected with their construction. In 1862, a new trawler, ready for sea, and what was then considered one of the larger class, could be built and fitted out for 700*l.* or 800*l.*; but the new class of vessels cannot be turned out at the present time for much less than 1200*l.* This includes a fit-out of all that is required for fishing, which costs from 70*l.* to 80*l.* A fit-out consists of a double set of almost every part of the gear, to provide against accidents, and to save the time which would otherwise be lost, if the vessel were obliged to return to port before she had done a fair quantity of work. A trawl-net will perhaps last from two to four months, according to the nature of

the ground worked on; but during that time parts of it will have to be renewed. The back of the net, being exposed to least wear, lasts the longest; the under parts will generally require renewing twice, and the cod or purse five or six times, before the whole net is finally condemned. Ordinary hemp is commonly employed for these nets; but the best Manilla hemp is coming into use at Grimsby and Hull. Manilla is very costly, but is more lasting. It is usually dressed with coal tar, which preserves the material better than either Stockholm tar or tan.

The sails of all our trawlers are what is called "barked," or saturated with a solution of oak-bark, tar, grease, and red or yellow ochre. This composition preserves the canvas, and is renewed every six or eight weeks.

Working the Trawl.—A fair idea of the construction of the beam-trawl has been given in the preceding pages; and it may be interesting if we say something now of the manner in which this net is worked. Nothing, of course, but practical observation on board a trawler will enable anyone to thoroughly understand all the points to be considered under the varying conditions of wind and tide, but the general mode of proceeding may be easily explained. A favourable tide is the first thing to be desired, one of only moderate strength, as the trawl, which is always towed as much as possible in the direction of, but a little faster than, the stream, then works steadily, and is easily kept on the ground. Supposing the vessel to be on her fishing ground, the first part of the tide is chosen for com-

mencing work, as she can then tow for several hours in one direction, and the usual practice is to keep the trawl down till the tide has done, about five or six hours at a time. The vessel is put under easy sail in the direction in which she is going to tow, depending on the wind being suitable for going with the tide. This is of such importance, that when the tide is running dead against the wind no work can be done, and the fishermen can only beat up against the wind in order to take a suitable position for trawling in the opposite direction as soon as the tide has turned; or, if the fishing ground be a large one, they heave-to, and wait for the favourable time. Most persons who have seen a trawl vessel either in harbour, or going out of or coming into it, will have noticed the long beam, with the curiously-shaped head-irons at each end, resting on the top of the bulwark, generally on the port or left side of the vessel when looking forward from the stern, and the immense net lying in irregular folds on the top of the beam. We may suppose this to be the position of the trawl just before the fishing begins. The vessel then being slowly sailing along her intended course, the first thing to be done is to put the net overboard, beginning with the small end, and throwing it out, or "shooting" it, until the whole is hanging over from the beam, and towing alongside. The front end of the beam is then slacked away till it is well clear of the vessel, and, being caught by the water, is turned outwards at nearly a right angle from the stern. The other end is then lowered from the stern, till the whole beam is level in the water; and if

the trawl be then in proper position, with the back uppermost and the ground-rope below, more sail is put on the vessel; the two ropes fastened to the ends of the beam are slowly and evenly paid out till the shackle joining them to the trawl-warp is reached; then the warp itself is steadily given out, and the trawl is allowed to sink to the bottom.

It will hardly be necessary to point out why the vessel should be moving through the water when the trawl is being lowered. It will be obvious that if the apparatus is to reach the bottom with the trawl irons under the beam, and the lower part of the net and the ground-rope in their proper position below, no risk must be run of the net turning round or twisting as it is being lowered. There would be great danger of this happening, if the vessel were not moving; the net would in such a case hang perpendicularly, and the beam would be almost certain to twist round, so that it would be a mere matter of chance whether the upper or under side of the net and beam would be the first to reach the bottom. If, however, as I have described, the net be got into proper position when at the surface, and the vessel be slowly sailed along, the net is then towed after it, and as the warp is given out, the net gradually sinks without changing its position, until at last it reaches the ground. Of course, experience teaches the fishermen how to regulate the speed of the vessel, and the rate at which the warp should be given out, so as to ensure just sufficient strain on the trawl to keep it steady whilst it is going down. These are matters which none but the practical fisherman

thoroughly understands; they require some little judgment to prevent mistakes, and mistakes are sometimes made by them; the strength of the tide may be miscalculated, or something else; and the irregular jerking action of the trawl, owing to the beam being on the ground instead of only the irons, tells the fishermen that the trawl is "on its back." In such a case there is nothing to be done but to heave up the net—a long and laborious process—and then, after getting the net into the proper position, to lower it once more.

Supposing that to have been done, and the trawl to be properly working, as can be easily felt by the even and steady strain on the warp, the master uses his judgment as to how much more warp should be paid out. It should be remembered that the weight of the trawl-net and the trawl-irons, without considering the beam itself—which, from being so continually under water, soon becomes saturated, and loses all its original buoyancy—is such as to keep the whole apparatus at the bottom, whilst the strain of the warp, by which the trawl is towed along, is in a direction slanting upwards. There are, therefore, two opposing forces, one tending to keep the net on the ground, and the other lifting it. The object is to regulate these forces so that the pull from the warp shall move the trawl lightly along the bottom, but without raising it from the ground. If there be too little warp allowed, the pull will be too much upwards, and the net will be lifted; if, on the other hand, there be too much warp, the irons and net will be dragged too much through the ground, and friction will be increased. One of the

conditions on which this regulation depends is the wind, for if there be very little breeze to drive the vessel along, the friction of the net and irons on the bottom may be sufficient to stop her way almost entirely. In such a case, very little extra warp is required, so that the lifting power may be increased, and the friction over the bottom lessened. But if there be a great deal of wind, which will drive the vessel along even with very little sail, and especially if, as in such a case is likely to occur, there is a good deal of sea, and the strain on the warp becomes irregular and jerking, then more warp is allowed to counteract the tendency that there is to lift the net off the ground. The faster the vessel sails, the more likely the net is to leave the ground; and as the trawl works most effectively when just touching the bottom, the master of the vessel has to calculate in a very rough way all the conditions required for making the net work properly. This, as I have before said, is a matter of experience, and the ready way in which these rough fishermen make their calculations, often, I will venture to say, without being able to explain their reasons, is shown by the successful manner in which they commonly fish in all kinds of weather.

I may now say a few words about the action of the beam-trawl when at work. This net is especially constructed for catching what are called ground-fish, those which, as a rule, keep at the bottom, and naturally hide under the sand or mud. With rare exceptions, all the soles, turbot, brill, and plaice brought to market are caught by the trawl; the various kinds of

skate or ray are obtained by the same means; and notwithstanding the peculiar habits of all these fish, there is very little chance of their escaping, when once the trawl-beam has passed over them. The ground which flat fish frequent is that with a smooth surface, and it will be evident that it is only on such ground the trawl can be effectively worked. The trawl is always towed with the tide, but a little faster than it is running; were it otherwise, the net, being lighter than the beam, weighted as it is with the irons, would be liable to be drifted forwards and prevent the entrance of the fish. The resistance of the water caused by the slight excess of speed in the trawl over the tide, varying according to circumstances, from half a knot to about a knot and a half in the hour, keeps the net expanded and in a proper position on the bottom. The ground-rope then does its duty. Its biting action or close pressure on the ground over which it is towed, is of the greatest importance when soles, turbot, or other flat fish are worked for, as these fish when disturbed do not rise from the ground, as is the habit with "round fish," such as whiting, haddock, gurnards, &c., but seek safety in the sand. When, therefore, as the trawl is slowly towed along, the ground-rope disturbs these flat fish, their first impulse is to dart forwards and again bury themselves; but the rope is steadily pressing on as the trawl advances, and they are again disturbed. This almost certainly ends in the fish, sooner or later, passing over the ground-rope and entering the net; they cannot escape upwards, because the back of the net is above them, and if they

dart forwards towards the entrance, they may have to go perhaps forty or fifty feet, the distance probably between the centre of the curved ground-rope and the beam, before they can get clear of the advancing net. The chances of escape are, therefore, very small, when once the back of the net is fairly over them. In the case of round fish, although they may dart some distance on being disturbed, the fact of their not trying to bury themselves, but to rise from the ground, enables the ground rope to pass under them often without further disturbance.

The great resistance offered by the trawl to the forward movement of the vessel towing it, a resistance sufficient to reduce her speed in a good breeze perhaps from eight knots to one knot in the hour, is very commonly ascribed to the supposed great pressure of the beam and net on the bottom, and to their not being towed lightly over the ground, but dragged through it. This has been the foundation of most of the arguments used by those persons who have declaimed against trawling, as causing the destruction of vast quantities of fish spawn, the opponents of this method of fishing apparently having been unaware that the trawl can only do its work when the beam is raised clear of the ground by the trawl-heads or irons. And the discovery by Professor Sars, that the spawn of almost all our edible fishes floats during development, explains the entire absence of evidence of fish spawn being brought up in the trawl, as the trawlers have been charged with doing to an enormous extent. The difficulty of towing the trawl over the ground is, with-

out doubt, almost entirely due to the resistance offered by the water, which expands this great bag net with a power only to be well appreciated by those who know the amount of labour required to haul in a simple curved wall of open netting, such as there is in a common sean. That such is the cause of the resistance is proved by the fact, that when at certain seasons the trawlers are specially fishing for hake, which keep very near the ground, but not absolutely upon it, and the net is therefore towed along almost clear of the bottom, the resistance is so great, that a heavy press of sail is necessary, in order to obtain a slight but desirable increase of speed over that needed for ordinary trawling.

After the trawl has been towed over the ground for five or six hours, the tide having done, or the limit of the particular fishing ground having been reached, the net is hauled up. In the west country vessels, the warp is hove in over the bow by means of a large winch in front of the mast, or, in the new vessels especially, by a patent capstan near the middle of the vessel; but in the North Sea trawlers, the warp is got in over the port side, and the capstan is always used. In either case the process is a laborious one, generally occupying three-quarters of an hour, and, if there is much sea on, sometimes as much as three hours. The warp is coiled away below as it comes in, and the beam, having been swung alongside, hoisted up and secured, the net is gathered in until nothing remains in the water but the cod or purse at the end, in which almost all the fish are collected, those which had entered the pockets

having been shaken down into the purse as the main body of the net was hauled in. If there are only a few fish in the purse, it is lifted in by hand; but when, as often happens, there is from half to three-quarters of a ton of fish, the bag is hoisted up by a tackle, and before being lowered on board, the draw-rope, which I previously spoke of as closing the end of the net, is cast loose, and the whole mass of fish falls out on deck. The scene is a remarkable one, as, with few exceptions, the fish are all alive and brilliant with their natural colours. The contents of the net are frequently of a most varied description, and they of course differ according to season and locality. Turbot, soles, plaice, whiting, gurnards of several species, dogfish, skates, with occasionally a lobster, crabs of various kinds, with a host of other inhabitants of the sea—friends and foes, the pursuers and the pursued—are here mingled in one writhing and slippery heap. In some parts of the North Sea the catch commonly consists of little besides haddocks; in others plaice are the principal fish. But they are not left very long to expend their energies in useless flappings; sorting the fish takes place without delay; the "prime," or turbot, brill, soles, and red mullet, are picked out and packed away in baskets by themselves, and the other edible but inferior kinds, technically known as "offal," are arranged in separate packages, whilst the fisherman's mortal enemies, the dogfish, are knocked on the head and thrown overboard, with whatever else there may be of no use to anyone. In the North Sea, where the trawlers stay out for many days at a time, the fish

is stowed away in the hold with layers of ice between; but at Brixham and Plymouth the vessels return to harbour every day, and no ice is taken on board.

The kind of weather is an important consideration, when trawling has to be carried on. The hot summer months are those in which the least work can be done, because then there is frequently not wind enough to tow the trawl over the ground. But in winter the trawlers are in constant work, and such weather as is sufficiently bad to put a stop to most other kinds of deep-sea fishing, often enables the trawlers to gather in the richest part of their harvest. It is a rough life they have to lead; but there is a charm in it which makes them follow it up, when once they have become initiated into the work. With good vessels under them they go farther to sea, stay out longer, and are exposed to worse weather, taking the year through, than any other kind of fishermen. They consequently become thorough sailors; but their training is due to their constant liability to hardships and dangers, more especially in the troubled waters of the North Sea. As hard-working fishermen and sailors, the trawlers stand in the front rank; and I may add that, as a rule, they are equally conspicuous for their honesty and sobriety, a very large proportion of them being teetotallers, and coffee their favourite drink. Good sailors as they are, however, the terrific North Sea gales in which they are sometimes caught, are more than they can always contend with. But they are too far from land to have much hope of gaining shelter; they must battle it out as best they can; and when, after days of anxious

watching and waiting by wives and mothers on shore, some of the smacks return and report that one or more of the fleet have not been seen or heard of since the gale—that perhaps a boat has been picked up, or floating wreckage identified as belonging to a fishing craft, then the truth comes home in all its bitterness, that the missing trawl smacks and their hardy crews will never again be seen.*

The depth of water in which the trawlers work is generally from twenty to thirty fathoms; very rarely in as much as fifty fathoms, and then only in one or two particular localities. The most important and extensive trawling grounds are in the North Sea; and among the numerous grounds in the neighbourhood of the Doggerbank, to which names have been given, and which are resorted to year after year by hundreds of trawlers, according to the season, are the Inner and Outer Well Banks, the Great Silver Pit, and Botany Gut. The Great Silver Pit was discovered in a very severe winter, about 1843. Trawlers were then only feeling their way in the North Sea, and the vessels which worked there were very few. But in the course of their explorations they came on this particular locality, and for many miles in an easterly and westerly direction, the soles, then driven into deep water by the extreme cold, had congregated in such myriads, that the oldest trawler had never seen such a sight as was presented by the trawl nets, after being worked over

* Since the above was written, thirty-nine trawl smacks, with crews of 228 men and boys, have been totally lost in the North Sea. It is believed that this unprecedented loss of fishing craft took place during one terrible gale, in January 1877, when upwards of 100 other trawlers were more or less disabled.

this ground. The news soon got abroad, and a migration of trawlers took place to the North Sea from Brixham and Ramsgate, then coming into notice as a trawling station. When the weather broke up, however, the soles dispersed; but the trawlers thenceforth gave more attention to the North Sea, and year after year, up to the present time, the number of North Sea trawlers has increased, with the result of a proportionate increase in the supply of fish from this great fishing ground. In any very severe winter, or, as it is called, a "Pit season," the trawlers still work the Great Silver Pit with wonderful results, and every winter the catches of soles there are on a large scale, but varying very much with the temperature of the season. Nearer the land there are many banks on the Norfolk and Lincolnshire coasts, others farther south off Hastings and in mid-channel; whilst in the west, the Brixham and Plymouth grounds, small though they are, have long been productive of a large supply of fish of various kinds, according to the season. On the east and south coasts of Ireland, also, and recently on the south-west coast of Scotland, trawling has proved a successful and profitable method of fishing. No more conclusive evidence against the outcry which is periodically made by alarmists in the newspapers, that the trawlers are ruining our sea fisheries, can be brought forward, than the simple fact that, at the present time, the Brixham men have a larger number of trawl vessels, are catching more fish, and making more money, than they have ever done since Brixham was a fishing port, and the majority of their vessels are now working over the same limited ground

throughout the year, as they have fished on for the last hundred years; and in the winter the whole fleet finds profitable occupation there. The evidence afforded by the Brixham fishery is very important, for there is little doubt of Brixham being the oldest trawling station, and, as it is often called, the "mother port of the trawlers."

I have previously spoken of the two classes into which, for market purposes, trawl fish are divided, "prime" and "offal;" and I may now say a few words about the average proportion of the one to the other, which is obtained in a year's fishing. It is impossible to speak of a daily or weekly average, as in the North Sea many of the trawlers work after particular kinds of fish during certain seasons. Some specially seek after haddock or plaice on grounds where those fish at a certain time of year are known to be abundant. Almost all the catch under these circumstances would count as "offal," although a ready market would be found for it; at other times soles may be worked for on the same system, and a large proportion of the catch would be of a "prime" description; others again may fish on ground where the take would be varied. The average value of each kind of fishing may probably not differ materially from that of the others; for where prime fish forms the bulk of the catch, the quantity is likely to be small, and its total value may not exceed that of the frequent very large hauls, mostly of the commoner fish or "offal." Both kinds are constantly wanted, and the price of each varies according to the supply sent in. From a careful record kept by Mr. Henry Knott, of Grimsby, of the actual produce

of one of his smacks during each of five following years, and which may be taken as fairly representing the work of a trawler with average success, we may put the proportion of prime to offal as about one-fifth; but the money obtained for even that small proportion of the best fish, was more than twice as much as was received for the larger quantity of inferior kinds. This record was of a North Sea trawler; but at Brixham, where large quantities of red mullet are landed in the latter part of the summer, the proportion of prime fish would probably be larger, and the money returns increased. Red mullet are mostly confined to the south and west of England, and they are there properly included among the prime fish.

Haddocks and plaice are caught in almost incredible numbers in the North Sea; and some years ago the former were looked upon as almost worthless, for the means of selling them fresh, before the extension of railways from the coast, were extremely limited; but now, in addition to the increased demand for the fresh fish, the practice of drying and smoking the haddock is so largely adopted, that every one of them that comes to market is sure of finding a purchaser.

The number of sea-going trawlers now working on the English coasts cannot be less than between 1600 and 1700; and of these more than 1200 systematically fish in the North Sea.

I may here say a few words on a subject to which the attention of fishermen may be profitably directed, viz. the spawning habits of sea-fish. There is nothing about which they speak with greater confidence than

of fish, of almost every kind which they are accustomed to catch, having certain grounds which they frequent at particular seasons for the purpose of depositing their ova. Yet it will hardly be credited that the herring is the only one of those fish whose spawn has ever been found on the ground. And the evidence on this point is by no means only of a negative character. During the last ten years Professor G. O. Sars, under the direction of the Swedish Government, has been investigating the subject of fish-spawning, and has obtained the most positive evidence of the ova of several of our best-known fish floating at the surface during the whole period of their development. Among those whose ova have been found floating, and have been successfully hatched out, and the young fish identified beyond a doubt, are the cod and haddock. If such be the case with these two species of the same genus, there is hardly room to doubt that the very closely allied species, such as the whiting, coalfish, pollack, hake, and tusk, have precisely the same habit of spawning at the surface. The spawning of the mackerel at the surface has been repeatedly seen, and the floating ova have been collected in all stages of development, and thoroughly identified. Still more surprising is the fact, that Professor Sars and M. Malm have independently discovered on different parts of the Norwegian coast, that the common plaice, regarded by naturalists as the typical representative of the family *Pleuronectidæ*, which includes all our various kinds of flat fish, has precisely the same habit of spawning at or near the surface, and

that the ova of this fish also float during the whole period of development. This has been proved by both the naturalists I have mentioned; and there is every reason to believe that turbot, brill, sole, and other closely allied species, do not differ in this respect from their very near relation, the common plaice. Professor Sars has lately succeeded in hatching the eggs of the gar-fish, also found floating; and as he has been successful in hatching three or four other kinds of ova, the young fish from which he could not positively identify, and as he is continuing his investigations, we may look forward to further information from him on this interesting and important subject. I have omitted to mention the gurnard among the species whose floating ova he has also identified. It is obvious, therefore, that the idea that fish as a rule deposit their ova on the ground, is a mistaken one; and the bearing of these discoveries on the possible destruction of fish spawn by the trawl nets, and the consequent injury to our sea-fisheries, need hardly be pointed out. Had I space at my command, I might also bring forward strong evidence to show that the periodical visits of certain fishes to our coasts are not necessarily for spawning purposes, as is generally believed. It is true that large numbers of herrings come near the shore when they are ready to spawn, and that they do spawn there; but vast numbers of herrings which are not at all in spawning condition also come in. There is no fish which comes nearer the land at certain seasons than the mackerel; but there is not the slightest doubt about this fish spawning in the open sea; in

fact, it enters our bays and harbours mostly after the spawning is over. The subject of the spawning habits of sea-fish is a very interesting one, and I have now noticed it, in the hope that it may receive more attention than hitherto from fishermen and persons who have opportunities of studying it along our extensive line of coast.

DRIFT-NET FISHING.

THIS mode of fishing has been in use for many centuries; and although there is no evidence to show where it originated, or when it was first adopted in this country, there is every reason to believe that the long-famous Yarmouth herring fishery, of which we hear as early as the sixth century, has always been carried on by means of drift nets. The importance of drift-net fishing is shown by the fact, that it is the only method by which fishes such as herrings, mackerel, and pilchards, which generally swim at or near the surface, can be readily caught in the open sea, at any distance from the land, and in any depth of water sufficient for the nets to float in their proper position.

The term "drift nets" is derived from the manner in which the nets are worked. They are neither fixed, towed, nor hauled within any precise limits of water; but are cast out or "shot," the technical expression for throwing out or putting a net into the water, at any distance from the land where there are signs of fish, and are allowed to drift in any direction

that the tide may happen to take them, until it is thought desirable to haul them in. When at work, they are extended in a long single line, it may be one or two miles in length, their upper edge being supported at or near the surface by means of floats, the nets hanging perpendicularly in the water, and forming, as it were, a perforated wall or barrier many hundred yards long and several yards deep. The shoals of fish, in their endeavours to pass through this barrier, force their heads into the meshes, the size of the mesh used depending on whether herrings, mackerel, or pilchards are expected to be caught, and being such as to allow the head and gill-covers to enter, but not to permit the thicker body of the fish to go through. When the fish has found its way through the net beyond the gill-covers, it may generally be considered as effectually meshed; there is, indeed, little chance of its escape, for the mesh is only large enough for a fish of average size to push its way so far, when the gill-covers are laid close to the body; but it is necessary for them to open again that the fish may breathe, that is, that the water which enters the mouth may, with the air it contains, pass over the gills, and after purifying the blood within them, just as the air we take into our lungs purifies the blood they contain, escape through the gill opening on each side of the head. As this is taking place, and the fish is at the same time hampered by the net, the mesh slips forward and catches in the gill opening, from which it cannot easily be cleared without more or less injury to the fish. In drift-net fishing, then, the nets act as barriers to intercept the moving shoals, and

the fish become meshed in their attempts to pass through.

It is found that certain conditions are favourable for drift-net fishing. It will be readily understood that the more indistinct the net is in the water, the more likely the fish are to swim against it and to become meshed. The night is therefore, with extremely rare exceptions, the time chosen for drift fishing; and it is noticed that just after sunset and just before sunrise, when the change is taking place from light to darkness, or the reverse, herrings especially are most likely to "strike" the net, as it is called. This is a point in connection with the habits of the herring which is little understood. A ripple on the surface of the water is also a favourable condition; and this is easily explained; for if the surface of the sea be at all broken, such light as falls upon it is reflected by every little wave, and therefore does not penetrate to the nets so as to make them visible. Some very interesting observations have also been made on the Scotch coast, with respect to the temperature of the sea during the herring season, and its possible relation to a successful fishery. The late Marquis of Tweeddale, who was President of the Meteorological Society of Scotland, provided a number of deep-sea thermometers to be used by the fishery officers and the fishermen, for the purpose of testing the temperature of the sea at different periods of the fishery. The results for the years 1874 and 1875 only have as yet been made public, and the Committee of the Society state that the conclusions arrived at must therefore only be considered

as provisional; but they point to a high degree of temperature in the sea being unfavourable to fishing, and that when the sea is found to be colder in any one district than in that on either side of it, the herrings are more abundant and the fishery is more successful in the colder than in the warmer water. The committee also state, as quoted in the Report of the Scotch Fishery Board of the fishery of 1875, that "the influence of thunderstorms was equally seen as in former years. If there is a thunderstorm of some magnitude, extending over a large portion of the east of Scotland, good takes may be made on that day, but on the following day, few if any fish are caught over that part of the coast, *unless at the extreme verge of a deep part of the sea*, as if the fish were retreating thither." Observations on the influence of winds and the temperature of the sea have also been made by the Dutch fishermen; and Herr von Freedon, of Hamburg, Director of the German See Warte, believes, from an analysis of these observations, that a temperature of from 53 to 57 degrees of Fahrenheit is most favourable for the herring fishing, and that the chances of success diminish with higher or lower temperatures. These investigations are of very great interest; and if the results do not teach the fishermen how to make a successful fishing every year, they may at all events account for failure when it does occur, and so prevent a repetition of the mischief, which, before now, has been caused by the senseless cry that the fisheries are being ruined. There are many problems to be solved in connection with the movements of wandering fishes,

like the herring, mackerel, pilchard, and sprat; and any bit of information which we can gain about their habits may help materially to guide us in our subsequent inquiries.

For a description of drift nets and the mode of working them on a large scale, I cannot do better than give some account of the method by which the Yarmouth herring fishery has long been carried on. Drift fishing, "drifting," or "driving," as it is variously called, although the last term is the one in general use among the fishermen, is there worked with fine sea-going decked boats, larger in every way than those similarly used on other parts of our coasts; and the fishermen can consequently venture farther to sea, and run the chance of worse weather, than most of the smaller boats are capable of doing with a due regard to safety.

The nets used for drift fishing are made either of cotton or hemp—"twine," as the latter is called, some fishermen preferring the one material, some the other; and it is not unusual for the two kinds to be placed alternately in the same train of nets. Cotton nets are finer in the line and more flexible than those made of hemp, and they are generally believed to be more effective in meshing the fish. Machinery of a very beautiful and ingenious character is employed in making these nets, and large supplies have been for some years past turned out from the factories at Bridport, Musselburgh, and many other towns. Cotton nets are now very largely used, and there is every reason to think they will be universally employed for

all kinds of drift fishing. When new, they are first saturated with linseed oil, then squeezed through a machine, afterwards dried, which takes some days, and, finally they are put into a vat, and hot bark liquor is poured upon them; in this they remain for two or three days. The bark liquor is a preparation in which catechu is an important ingredient, it having practically superseded the oak bark formerly used for tanning nets. In some cases the nets are dressed with coal tar instead of being barked. The herring nets come from the factory in "pieces" 60 yards long and 9 or 10 yards deep, the depth of the net containing 200 meshes; and it is the custom of the fishermen, when speaking of the size of a net, to say it is so many yards long and so many meshes deep, as the case may be. Each piece is divided into two nets 30 yards long. When a net is prepared for use, it is "mounted," or fastened lengthwise along one edge to a small line only 18 or 20 yards long, that length of line being appropriated to the 30 yards of net, so that the "lint," or netting, is set slack, and gives way a little when the fish strike it; and from its flexibility the net holds the fish better than would be the case if it were fully stretched. The ends of the net are called the "heads," the roped edge of the length the "back," as that is uppermost when the net is in the water, and the lower edge the "foot" or "sole." The heads are roped, as well as the back; but the foot is usually left free, so as to be less likely to hitch in anything at the bottom, when the nets chance to be used in rather shoal water or near the ground. The back of the net

is further fastened at intervals of a few inches by very short lines called "nossles," to the cork-rope, a small double rope enclosing at various distances pieces of cork as floats, to keep that part of the net uppermost. The number of such nets used by each vessel depends very much on her size, and ranges from eighty to one hundred and thirty. They are fastened together end to end, and, thus united, form what is called a "train, fleet, or drift of nets," frequently extending to a length of more than a mile and a quarter. The mesh in a herring net is about an inch and a quarter square, equivalent to thirty or thirty-two meshes to the yard when the net is new; but after long use and frequent barking or tarring, it becomes contracted to an inch, or even less.

Twine nets have been hitherto netted by hand, and for convenience in the manufacture, are usually made up of several narrow pieces called "deepings," which are laced together one below the other, there being three or four deepings in the depth of a net. Twine nets are much heavier than those made of cotton, and consequently involve more labour in working them. There can be no doubt also that from the greater stiffness of the meshes, the fish are not so readily caught in them. On the other hand, it has been said that more fish are lost from cotton nets, the sharpness of the fine cotton-mesh cutting into the neck of the fish, and tearing off the head when the fish hangs from the mesh whilst the nets are being hauled on board. This objection, however, cannot be a very serious one, or cotton nets would not be so largely employed as is now the case.

There are still one or two things to be noticed, before I come to speak of the working of the drift nets. I have already mentioned the corks on the cork-rope, as specially intended to keep the back of the net uppermost. These floats in ordinary nets are merely placed there for that purpose, and are not meant to keep the nets at the surface. The weight of the net is considerable, and it is desirable that they should be heavy enough to sink, because the herrings do not always rise to the surface; it is necessary, therefore, to manage so as to place the nets where it is likely the herrings will be. This is, of course, a matter of uncertainty; but the fishermen judge from the state of the weather, and other signs, how far the nets should be sunk. There is, however, some difficulty about this too; sometimes they hit on the right distance, sometimes no fish are caught. The failure may be from the nets being too high or too low, or it may be from the absence of fish in that part of the sea. In any case the nets have to be buoyed up, and for this purpose small kegs, termed "bowls," are used, and one of them is fastened by a rope to each of the nets, the rope being long enough to allow the nets to sink several fathoms; or, if thought desirable, it may be so shortened as to bring the net close to the surface. It is found convenient to colour the bowls, so as to mark the different parts of the fleet of nets. The first net is marked by a small white bowl, called the "puppy," and at the end of the first four nets is a "dan," or buoy, with a pole carrying a small flag. The rest of the nets are marked in four divisions; at the first

quarter from the pole is a bowl painted one quarter red and three quarters white; the next is half red and half white; and at the commencement of the last division the bowl is three quarters red and one quarter white. The intermediate bowls are all black. The only other part of the apparatus is the warp, a stout rope, to which each net is made fast by two small ropes called "seizings." The object of having this warp is to facilitate the hauling in of the nets, to take off the direct strain upon them when this is being done, and to prevent any of them being lost, in case of their being cut through by accident. Drift nets being used almost entirely at night, and often extending for a long distance in the course of vessels passing up or down the coast, are sometimes liable to be damaged by these vessels running over or through them; and if by chance the train of nets is thus divided, the warp which hangs below and is fastened to each one holds the nets together, and prevents any serious loss from the nets being carried away.

All the vessels used in the Yarmouth fishery are decked; the largest of them, about 36 tons, N.M., being 52 feet on the keel, with 17 feet beam, and 7 feet depth of hold. They are lugger-rigged, with two masts only, and carry a jib, a large dipping foresail, and a working mizen and topsail. The mizen-mast is always kept standing; but to enable the vessel to ride easier when fishing, the large foremast is fitted so as to lower backwards, on the same principle as may be seen any day in the Thames barges, or in vessels which have to pass under bridges in inland navigation.

The mast in these Yarmouth luggers is, however, not lowered completely on deck, where it would be very much in the way when the nets are being hauled in, but is kept for the greater part of its length at such a distance from the deck as to allow plenty of room below it for the men to move about and work. It is supported about the middle by a broad upright piece of wood called a "mitch-board," and which has a crutch at the top on which the mast rests. The same kind of support for the mast is used in all drift-fishing boats of any size, whether decked or open, but it is not always of precisely the same form.

The internal fittings in these luggers are in accordance with the requirements and convenience of the fishery, and the hold is divided into compartments for the fish, nets, warp, &c. A considerable quantity of salt is carried by the Yarmouth boats, as a good sprinkling of this preservative is desirable to ensure the delivery of the fish in good order, after having been perhaps caught for many hours.

As many as from nine to twelve men form the crew of one of these large fishing-boats. Time is valuable in drift fishing; for if the fish are abundant, the nets are not allowed to remain long in the water, but are hauled in and shot again without delay. All this is very laborious work; and more than half the crew are not regular fishermen, being merely shipped for the season as "capstan-men," many of them being countrymen, or persons who have very little experience at sea, but who have strong arms for working at the capstan, by which the warp, and with it the nets, are hauled in.

The time universally chosen for putting out, or "shooting" the nets, as it is called, is just before sunset; and the vessel being in what the master has reason to think is a likely place for fish—a point, however, about which there is generally some speculation, she is put before the wind, and as she sails slowly along, the net is shot over her quarter, that is, over the side near the stern. Whilst this is going on, the men are distributed at regular stations, some handing up the net from below, others throwing it over and taking care that it falls in the right position, others, again, looking after the warp and seeing that the "seizings" are made fast to it in their proper places. When all the net is overboard, and fifteen or twenty fathoms of extra warp, termed the "swing-rope," are paid out, the warp is carried from the stern to the bow of the vessel; she is then brought round head to wind, the ordinary sails are taken in, the mast is lowered till it rests in the crutch of the mitch-board, a small mizen sail, called the "drift-mizen," is set to keep her head to wind, and the regulation lights are put up to show that the vessel is fishing. A certain number of men then remain on deck as the watch, and the vessel and nets drift with the tide.

It is important that a strain should be kept on the nets so as to extend them; it will therefore be readily understood why the nets are shot in the direction in which the wind, much or little, is blowing; for the vessel being to leeward of the nets when they are in the water, and offering of course more resistance to the wind than they do, drifts more rapidly, and consequently pulls

upon the nets and keeps them comparatively straight. In Loch Fyne and other large inlets of the sea, where, in the summer nights, the surrounding hills keep off any little air of wind there may be stirring in the neighbourhood, and where the boats are small and fishing in large numbers close together, great confusion sometimes occurs from the nets of different boats becoming entangled; but such a thing rarely happens at sea, where there is more room, and the faintest air is felt by the fishing boat. When there is a great deal of wind, more swing-rope is allowed, and the vessel sometimes rides to the nets with as much as 100 fathoms of clear warp out, the "spring" of the warp under such circumstances easing the strain on the nets.

Whilst the nets are in the water, the warp is occasionally hauled in till the first net is reached; this is called the "look-on" net, and by examining it, some idea may generally be formed of whether many herrings are about, or the dogfish are numerous. The latter are at times very mischievous, and do a great deal of damage to both the fish and the nets if they are left long in the water.

I now come to hauling in the nets; this operation is performed in the same systematic manner as I spoke of just now in connection with shooting the nets, the men being told off to their regular stations, and each having his appointed duty. I need only mention, however, that the "capstan-men" are now important persons, for the capstan is the means by which the warp and nets are got on board. As soon as the

fish are all shaken out of the nets, they are sprinkled with salt and then stowed away in their proper compartments in the hold of the vessel. When the night's fishing is over, the mast is got upright again, the sails are set, and the vessel either returns to port, or, if the catch of fish has been small, shifts to a fresh berth for the next night's work.

Drift nets for mackerel are made and worked on precisely the same principle; but as these fish generally keep near the top of the water, the nets are well corked so as to make them float quite at the surface, and there is no occasion for such a depth of netting as is used when fishing for herrings. A "fleet or train" of mackerel nets, as used by the Yarmouth boats, is, however, of very great length, and is made up of eleven or twelve score of nets, extending to as much as 2½ miles, or double that of a herring fleet. The meshes are of course larger than those in a herring net, there being usually twenty-two or twenty-three to the yard. Cotton is also being adopted for mackerel nets, whenever the old twine ones become unfit for use; but the change is only being made gradually, as the outlay necessary for a complete fleet of mackerel nets is very large.

Pilchard drift-nets, principally used on the coast of Cornwall, are about the size of those used for herrings, with a slightly smaller mesh. Shrunk herring-nets are frequently employed in the pilchard fishery, when the meshes have become too small for their original purpose.

The circumstances which guide the drift fishermen

in their selection of any particular spot for fishing, are commonly of a very uncertain character, and at times there is nothing more to influence them than their knowledge that the fish were in some particular locality or at a certain distance from the land at a corresponding period in former seasons. At the commencement of the fishing season, they can only be guided by such considerations; but when the fish are becoming more abundant and occasionally showing themselves at the surface, what is called the "appearance of fish," that is, large collections of sea birds and the presence of whales and the smaller species of cetacea, are a tolerably sure indication of there being plenty of fish in the neighbourhood. There must necessarily be a great deal of uncertainty in a fishery of this kind, for practically there is nothing known of the causes which influence the shoals of fish in their daily movements, although it seems probable that the greater or less abundance of food is an important one. The phosphorescent light produced at times by myriads of minute medusæ and other marine animals when disturbed, especially in calm warm weather, is frequently made use of by the fishermen in their search for herrings, and often leads to the discovery of fish when other indications are absent. The light is called by the fishermen by the names of "briming," "waterburn," or, on the Northumberland coast, "marfire." When the water is in this condition, the slightest agitation, as is well known, produces sparks or flashes of light; and the presence of fish is often indicated by the streaks of light which are caused by their sud-

denly darting through the water. These signs of fish are sometimes observed as the fishing boat is rowed along over the calm sea; but I have also seen the fishermen produce a more decided effect by rapping with a piece of wood against the planks of the boat nearest the water; now and then a fish would betray itself by a line of light as it darted away, and when these indications became more numerous, it was decided to shoot the nets. This luminous condition of the water, however, is not very favourable for fishing, although I have seen moderate hauls made under such circumstances. The water is then usually too clear and the nets are too distinct for the fish to strike freely; and, beautiful as the illuminated nets appear as they are drawn through the water, the fishermen have then generally good reason to expect the result of their night's labour will not be very large.

The seasons for drift fishing depend of course on the kind of fish sought for, whether herrings, mackerel, pilchards, or sprats; for although the last-mentioned fish is principally caught in the stow-net and sean, drift nets are also used for it on a certain limited part of the coast. But the seasons for the same kind of fish—we may take the herring as a notable example—also vary according to the different parts of the coast; and this difference in the seasons leads to much larger captures in the course of the year than would otherwise be the case, for the boats from several districts are commonly enabled to unite in working successively at different stations, instead of being confined to their own. Thus many of the Scotch fishermen

from the east coast come south as far as Yarmouth in October and November for the herring fishery, which is then in full work in that neighbourhood, and the Yarmouth men begin their fishing in July very much farther north than the coast of Norfolk. The old theory of the migration of the herring is now altogether out of date; and such evidence as has been obtained of the habits of this fish, leads to the belief that the only definite changes of locality it makes are from deep water, more or less distant from the land, to shoaler water near the shore, or the reverse. The object of these movements has yet to be explained. Where there is very deep water not very far from the land, herrings are likely to be found more or less at all times of the year, as seems to be the case particularly at the Outer Hebrides. There are certain months, however, in which they regularly make their appearance, and are successfully fished for on a great part of the coast of the British Islands. The fishery season, although not at the same period in all parts, is tolerably regular for each district; and this, taken in conjunction with the fact that certain districts are commonly visited by fish having particular characters of size or appearance, which according to many of the salesmen are sufficient to enable them to speak with some confidence as to where they were caught, confirms the growing opinion that herrings do not move very far from their native waters.

Enough is known of their movements, to justify the belief in two very distinct arrivals of these fish on many parts of our coast, wherever they may come

from, producing the summer or autumn, and winter fisheries. In some districts the winter herrings are not observed; in others, they are seen but not fished for, as the bad weather at that time often interferes materially with systematic work, or other and more profitable fisheries may claim the attention of the fishermen. In other places, again, the winter fishery is the only one in the district.

The great herring harvest is almost everywhere gathered in during the second half of the year. From the Shetlands, by the east coast of Scotland, almost down to the Humber, the herring fishery takes place from July to September. It is rather later, however, about Flamborough Head, and the home fishery at Yarmouth and Lowestoft is from September to the end of November. In the Channel the general fishery is still later, although small fat herrings are often taken by the Hastings boats during the mackerel season in June. At Ramsgate, October and November are the regular months; but in the west, the fishery takes place quite in the last part of the year, and in the more distant parts, even in January or the beginning of February, running into the period when the winter fishery, as distinct from the autumn one, is carried on along both coasts of Scotland. It might be supposed that as the herrings appear on our extreme northern coasts at the beginning of the general fishing season, and are gradually later as we proceed south, there was some foundation for the old theory of migration, and that the fish caught in the Channel in December are the remains of the shoals which were

on the coast of Scotland in August; but, as we shall see, the condition of the fish at the different places is opposed to such an idea. In the north the herrings are "full" in August and at the beginning of September; then they spawn and disappear. Those caught in the neighbourhood of Yarmouth are not in the best condition—that is, full of roe—till October and November. It is extremely unlikely, therefore, that they should belong to the great shoals which were spawning two months earlier in the north. Again, at the eastern end of the Channel the fish are full in November; but on the Cornish coast and in the west generally, the herrings are not in spawning condition till December, or even a month later. These differences appear to point to the shoals being distinct and somewhat local, and are quite inconsistent with any theory of general migration from the Arctic Sea.

At the Outer Hebrides and on the west coast of Scotland, the herring fishery begins in some places as early as April, and goes on continuously till nearly the end of September, when the herrings spawn; and a separate winter fishery is carried on in January and February. The fishermen in these parts say that the herrings are always on that coast, but of course vary in their condition at different times. The spawning seasons there appear to be in September and February or March.

When we come to the Firth of Clyde, with the long-famous fisheries in Lochfyne and the Kyles of Bute, we find that the herring season is from June to September;

but according to the fishermen of Lochfyne—and there is not the slightest reason to doubt the accuracy of their statements in this matter—some herrings may be caught in parts of Lochfyne throughout the year.

The Isle of Man fishery begins on the western side of the island in June, and finishes on the eastern side in October, when the fish are observed to be in spawning condition.

The herring fishery on the north of Ireland is from July to September, and rather later on the east coast —that is, in the Irish Channel—where an important fishing is carried on, and in which Scotch, Manx, and Cornish, as well as Irish boats take part. On the south and south-west of Ireland there appear to be two seasons—one lasting from May or June to September or October, and the other from Christmas to the beginning of March—the fish being in spawning condition at the close of each of these seasons. On the Atlantic side, however, the herring fishery is very uncertain, as the coast is too much exposed for regular deep-sea fishing to be carried on at night without considerable risk, even if the fishermen were provided with proper boats and gear, and had their hearts in their work; and the fish do not always come far enough into the deep bays on that coast to be caught in large numbers. In Galway Bay, however, many good fisheries have been made, and if the fishermen there were more peaceably disposed—the Claddagh men especially—more profitable work would be accomplished by them.

The drift-fishery for mackerel is principally on the

English and Irish coasts. Mackerel appear at first in deep water on the south and south-west of the British Islands, and are caught sometimes as early as January, sixty miles west of the Land's End. The general Cornish fishery, however, usually commences about the end of February, and lasts till some time in June. May, June, and July are, probably, the most productive months for mackerel fishing by drift-nets on the English coast. After the mackerel have spawned, which they do for the most part in June and early in July, the process taking place at the surface, as is well authenticated, the shoals disperse, and the fish, then readily taking a bait, are caught in large numbers by hook and line. At this time, also, they come very near the land, and consequently within reach of numbers of persons who fish only for amusement. The time when this popular sport is most successful is during the month of August, but it frequently lasts far into September along our western coast. Half-grown fish are also caught at times in the herring drift-nets off Hastings in October and November.

The mackerel fishery on the Scotch coasts is very unimportant, and drift-nets for the purpose are, so far as I know, unused there. A few mackerel are caught in Lochfyne and near the mouth of the Clyde in August, but only by the sean. The mackerel season at the Isle of Man is from June to August, but the fishery there again is not of much importance.

It is very different, however, when we come to the south of Ireland; and I am glad to say, that the Kinsale fishery has for some years been of considerable

consequence, not only to the fishermen of the locality, but also to the Manxmen and some Cornishmen, who resort to that neighbourhood at the proper season. This fishery is much the same as on the south coast of Cornwall, and lasts from March to June.

The drift-fishery for pilchards may be said to be practically confined to the Cornish coast; for, although many pilchards are annually caught along the south coast of Devonshire, these fish are not by any means abundant so far eastward, and, when they are taken there, it is more frequently with the ground-sean than by drifting. Pilchard fishing by drift-nets begins on the Cornish coast in July, and is carried on till nearly the end of the year. At first the fish are well out at sea, but as the season advances they come so near the land as to be within reach of the seans; and the pilchard drift-boats are forbidden by law to fish within half a mile of where the latter nets are being used. This restriction is to prevent any interference with a method of fishing which, if the pilchards are not disturbed when close inshore, has frequently proved, and may again in any year be, most successful and profitable. I may mention, that whilst most of the produce of the drift fishery is bought up for home consumption, the export trade in cured pilchards to the Mediterranean, and which has been carried on for a very great number of years, is almost dependent on the catches by the sean. St. Ives has long been celebrated for its sean fishery and export trade in cured pilchards; and the returns that I shall give farther on of these exports, and their great fluctuations from year to year, will show

how much may depend on whether or not the shoals of fish approach within a certain distance of a particular part of the coast favourable for seaning operations.

The distance from the land, and the direction in which the pilchards are first met with every year on the Cornish coast, appear to vary within some considerable limits; but it is probable that few of these fish are taken during the regular season farther at sea than ten or twelve miles, and they are usually south rather than west of the Land's End. On the south coast some of the shoals make an early approach to the land, and the fish are at the same time captured by both drift-nets and seans. They make an early appearance also on the south coast of Ireland, but they are not generally found at St. Ives, or along the northern part of Cornwall, till October and November. It is believed that the shoals which strike the Irish coast afterwards go southwards, a few being occasionally met with at the mouth of the Bristol Channel, but most of them appearing first near the Cornish shore, a little north of St. Ives; if they then in their course westward enter St. Ives Bay, the seans may do some profitable work; the movements of the pilchard are, however, so capricious, that it is as likely as not that most of the shoals may pass at some distance from the land, and under these circumstances the seans find very little employment, and the newspapers report another unsuccessful season at St. Ives.

There is little to be said about drift-fishing for sprats; it is only carried on about Ramsgate, Deal, and Hastings, by a few men in small boats, a short

train of fine-meshed untanned netting being used, with the result of some of the larger sprats being caught; but the takes of these fish are so enormous every winter by the stow-nets, to be presently described, that the small number caught by drift-nets can hardly be considered as of more than local importance.

LINE FISHING.

Under this head I may speak of two methods of working in very general use by our sea fishermen. These are by long-lines and hand-lines. One very simple distinction between them is, that the latter are practically kept in the hand of the individual fisherman who uses them, whilst the former are put out or shot, and then left to themselves for a longer or shorter period, before the fishermen haul them in, and take off the hooks such fish as may have been caught.

Both methods are employed on a large scale in the North Sea cod fishery, and it will be sufficient for my purpose if I describe the manner in which the Grimsby cod fishermen regularly work with them.

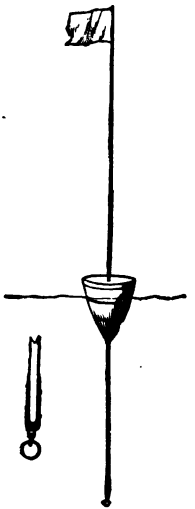
The long-line, spilliard, spiller, bulter, or trot, the names variously given to the same kind of line, according to locality or size, is used for the capture of many kinds of fish, and especially for cod, ling, holibut, and haddock, although turbot, skate, and other ground fish are also taken by it.

Long-lining from Grimsby is worked by means of

large smacks like the trawl vessels previously described. They carry from nine to eleven hands each, and remain at sea until they have a fair cargo of fish, part of the vessel being converted into a well to which the sea has free access, and in which as many of the cod as possible are kept alive until the vessel returns to port. A further description of this well will be given in subsequent pages, after I have spoken of the lines and the manner in which they are worked.

A complete set of long-lines, as used in one of these vessels, consists of about fifteen dozen, or 180 lines, each forty fathoms in length, and supporting twenty-six hooks on short smaller lines called "snoods," which are fastened to the main line at a fathom and a half apart, that distance being sufficient to prevent the snoods fouling one another and the hooks becoming entangled. A "string" of this description, made up of the 180 lines of forty fathoms each, fastened together into one, is 7200 fathoms long, equal to more than seven nautical or geographical miles, or about eight ordinary ones, and has 4680 hooks. These are baited with the common large whelk, which, owing to its toughness and substance, is not easily washed off the hook, and is an attractive bait for both cod and ling. Baiting these numerous hooks takes up a good deal of time, and gives plenty of employment to the several hands on board, before the line is ready to be shot. Work commences about sunrise, or earlier if the weather is fine, and sometimes a second shot is made if there be time; but the lines are always hauled in before night, as unhooking the fish, coiling away the

lines, and arranging the hooks in proper order, so as to be all clear for running on the next occasion, cannot be well done in the dark. Method is requisite even in the management of fishing lines, whether they are in use or in preparation for it. The line is always laid across the tide, so that the snoods may drift clear of the main line from which they hang. When a "shot" is to be made, the smack is put under easy sail, and kept with the wind as free as is possible consistently with crossing the tide, so as to make a fair straight course while the line is being paid out. The lines are neatly coiled in trays, and the baited hooks arranged in regular order for going overboard, each tray containing from twelve to sixteen pieces, and they are paid out one after another, until the whole length of line runs out as the vessel goes on her course. No corks or floats are used to raise it off the ground, but the line is kept steady at every forty fathoms by a very small anchor, and its position at the two ends, and at every intermediate mile, is marked by a conical hooped buoy, called a "dan," having a pole or staff passing through it, and carrying a small flag.



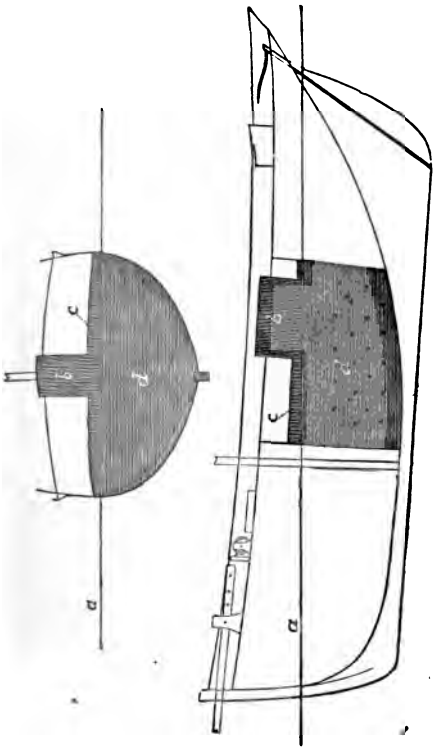
Buoy to Long-line.

The line is usually shot at half-tide, and when the

operation has been completed, the smack heaves-to in the neighbourhood of the last buoy, till the tide has nearly finished. The fishermen then proceed to haul up the line. The foresail of the vessel having been lowered to make room for the men to work at hauling in the line, and the end buoy having been got on board, the smack sails along the course of the line as straight as she can go, making short tacks when necessary, the direction of the line being shown by the buoys at each mile, which by practised eyes can be easily observed. The line is then hauled in as the vessel goes on, and the fish are taken off the hooks. If the wind be very light, and so much ahead that the vessel cannot closely follow the course of the line, the work is done from the smack's boat—a roomy one, about eighteen feet long, and with a well built in it, in which the fish can be kept alive for a time, until they can be put into the proper well of the vessel. As cod are not only the most valuable fish commonly taken by these lines, but also command a specially high price if they can be delivered perfectly fresh to the market, every precaution is taken to keep them alive; they are accordingly placed in the well of the vessel as soon as possible; and a large proportion of those which are lively and vigorous when taken off the hook, are capable of bearing many days' confinement in this way without any apparent loss of condition.

"Welled smacks," as they are called, were first tried in this country in 1712, at Harwich, and it has been said that the idea was taken from the Dutch fishermen. These vessels are specially constructed for the pur-

pose; the well not being a tank fitted into the vessel, but a part of the smack itself. Two strong water-tight bulkheads are built entirely across the vessel from keelson



Welled Smacks.

to deck, enclosing a large space in the centre of the vessel. This forms the "well" (*d*); and a constant

supply and circulation of water from the sea is kept up within it through large auger holes bored in the bottom of the vessel below the water-line, and between the two bulkheads. The entrance to the well is on deck, through a hatchway (*b*); and in front and on each side of it, at a short distance above the water-line, is what is called the "well deck" (*c*), which keeps the level of the water within certain limits, when the smack is rolling about or pressed down under sail. Cod are the principal fish put into the well, and when they have been caught in no great depth of water, and are strong and lively when taken off the hook, they will live a long time under these circumstances. It is a curious fact, however, that ling, which are usually taken in rather deep water, and cod from like situations, do not thrive in a vessel's well. Many deaths occur also among the general collection of cod, especially if they are numerous, and the vessel be exposed to bad weather, as the fish are then liable to be knocked about a good deal. A sharp look-out, however, is kept on them, and those which appear not likely to survive are taken out, killed, and packed in ice. Thus a cod-smack has generally a large number of dead fish as well as live ones when she returns to port, the former consisting not only of the cod thus taken out of the well, but also of others, with ling and haddock, which were put into ice as soon as caught. It is no uncommon thing for a smack to return from the Dogger after ten days' fishing with from twenty to twenty-five score of fine live cod, besides, perhaps, two-thirds of that number of fish in ice. Holibuts are easily kept alive in the well, and

find a ready sale at good prices in the Grimsby market.

The cost of these welled-smacks is considerable, and more so than that of "dry-bottomed" vessels of the same size; the term "dry-bottomed" being given to ordinary trawl-smacks and such fishing boats as have no well. This expression, however, would hardly be understood on those parts of our coast where welled-vessels are not used; the distinction between the two classes is not brought under the notice of the majority of our fishermen, for in most cases their knowledge of the various methods and appliances of fishing is confined to what are in use in their own localities. The working expenses of a line vessel are also greater than those of a trawler. Each cod-smack carries from nine to eleven hands, of whom six or seven are apprentices of different ages. The principle of paying by shares, so general among the trawlers, except in the case of the Barking men, is here only adopted in paying the captain. He receives nine per cent. of the proceeds of the "voyage;" the rest of the hands are paid weekly wages, the mate getting 24*s.* and the men 22*s.* each; the apprentices receive from 5*l.* to 12*l.* a year, according to their length of service. These wages are higher than they were three or four years ago; and I am glad to find, that the men who are exposed to all the hardships and rough work at sea which fall to the lot of those who catch the fish, have some share in the higher prices which, owing to the ever-increasing demand, fish of almost every kind now obtains in the market. Provisions for all hands are also found by

the owner, without any deduction for them from the wages which are paid.

Bait is an important item in the expenses of a cod-smack; it comes next on the list after wages, provisions, and depreciation of vessel, and costs more than the wear and tear of sails and rigging, great as that must be, when a vessel has to keep her ground in all weathers, for ten days or a fortnight at a time, through a great part of the year in the rough waters of the North Sea. Whelks, or "buckies," as they are called in Scotland, are exclusively employed as bait on the long-lines in these smacks. They are not only attractive to the cod, but from their toughness they give a good hold to the hook. The collection of whelk-bait is a regular trade, in which many small craft of from about twelve to eighteen tons N. M. are constantly employed; yet great difficulty is sometimes found in procuring a sufficient quantity for the purpose, the demand for whelks, in the London market especially, as an article of food among the poorer classes, interfering considerably with the supply of these shell-fish for the purpose of bait. A large number of whelks is obtained from the trawlers, but most of them are procured by special modes of fishing for them. At Grimsby, the plan is by shallow hoop-nets baited with refuse fish, and sunk to the bottom in suitable localities; the whelks, being carnivorous in their tastes, are attracted by the fish-bait, and collect in considerable numbers in the nets, from which they cannot readily escape when the nets are hauled up. Another plan is by baited baskets covered with netting at the top, except in the middle, by which the

whelks enter. The oldest method, perhaps, is that called "trotting," and is adopted especially about Harwich and near the mouth of the Thames. It is virtually long-lining, but instead of having a hook at the end of each short line or "snood" hanging from the main line, each snood is baited with the common shore crab, about twenty of these crabs being threaded on each line. The carnivorous propensities of the whelks here again lead to their capture, for they feed eagerly on this crab-bait, and are so unwilling to leave it when disturbed, that there is no difficulty in hauling lines and whelks together into the boat.

Some idea of the number of whelks required in the North Sea cod fishery may be gathered from the fact, that a smack takes with her on each "voyage" during the regular long-line season, as many as forty wash of whelks; the "wash" being a stamped measure capable of holding twenty-one quarts and a pint of water. At the close of the season, about March, a smaller quantity is sufficient. The whelks are kept in net bags, and are placed in the vessel's well, where they remain alive till taken out for use; the shells are then broken, and the animals extracted.

Dogfish are the great enemies of the long-line fishermen, and in some seasons destroy immense numbers of the cod, after they are hooked and before the line has been hauled in. When the water is clear, the hooked fish can be seen at a considerable distance, and their struggles to get free only make them more likely to attract the attention of the shoals of prowling "dogs."

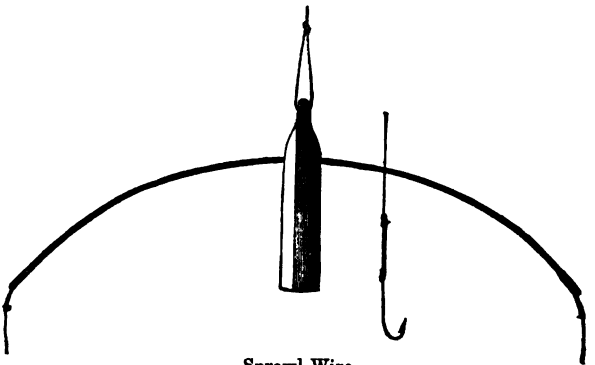
Long-lining is only carried on by the Grimsby boats

during the winter—the time when cod are best fit for the table. Rather rough ground is usually selected, and the smacks work on the Dogger from November to March or April, and on Cromer Knoll, a long-famous bank on the Norfolk coast, from November to February. The Dogger has been celebrated as a cod-fishing bank for a great number of years, and still retains its character as very productive ground.

In March or April long-lining is put a stop to, and very few line-cod are caught in the North Sea for the next three months. Many of the smacks then go away to Iceland and the Faroe Islands, and work with hand-lines for the cod which are found in more or less abundance in those localities. The fish caught there are always salted.

In July the smacks return, and commence hand-line fishing in the home waters, at distances generally ranging from ten to thirty miles from the coast. The herrings are about this time approaching the land, and are always attended by large numbers of cod and other voracious species of fish, which, following their prey, do not then keep so near the bottom as is their usual habit. Hand-lining, consequently, becomes then a more effective mode of fishing than long-lining. The hand-line in use for this fishery is about forty-five fathoms long, having at the end a leaden sinker of from five and a half to seven pounds weight, with a stout iron wire, called the "sprawl-wire," fixed in it near the top at right angles to the upright body of the sinker, and slightly curved downwards at the ends. To each of these is fastened a snood of smaller line,

six feet long, bearing a single large cod-hook twice the size of those used on the long-lines, as nothing but cod is now fished for. When the cod are numerous, five

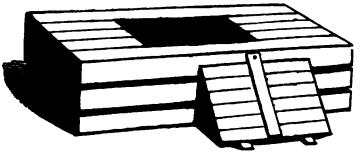


Sprawl Wire.

or six hooks are put on each snood, but usually there is only one to each. Whelk-bait is used, and the welled-smacks with their regular complement of men are employed as before. Whilst hand-lining, the smack is hove-to, and each of the men works one line, keeping the bait at such a distance from the ground as proves most successful, sometimes close to the bottom, or at other times, perhaps, within a fathom or two of the surface. The best fishing is generally towards the end of the day, and then all hands are kept busily at work. The fish caught near the coast are commonly smaller than those taken on the Dogger Bank; but after two or three months, when the herring fishery is coming to an end, the cod become scarce inshore, and the smacks

prepare for the long-lining in deep water, and there, as the winter comes on, the cod are again found in large numbers.

When the smacks arrive with their cargoes of live and dead fish at Grimsby, the cod in the well are taken out by means of long-handled landing nets, and are placed in wooden boxes or chests which are kept floating in the dock; there the fish are stored till wanted for the market. These cod-chests are seven feet long, four feet wide, and two feet deep; the bottom is made



Grimsby Cod-chest.

of stout battens placed a short distance apart, so that the water penetrates freely to the interior, as it does also between the planks of which the sides and ends are built up. The top is wholly planked over, except in the centre, where there is an oblong opening for putting in and taking out the fish. This opening is closed by a cover when the chest is in the water. Two ropes or chains are fixed in the ends of each chest for convenience in moving it about and hoisting it out of the water. About forty good-sized cod, or nearly a hundred smaller ones, may be put into one of these chests, and will live there without much deterioration for about a fortnight. There are usually as many as 400 of these chests in the Grimsby fish-dock, some-

times all in use, and containing from 15,000 to 20,000 live cod.

Every day during the cod season a remarkable scene is presented here, and the same thing occurs at Harwich, although on a smaller scale, Grimsby and Harwich being the two ports where the live cod are stored. A certain number of fish being wanted for market, the salesmen make their preparations accordingly, and the cod are taken out of the chests and killed. I say killed, because the fish are not merely taken out of the water and allowed to die, but they are dispatched in a very summary manner. A chest of cod is brought alongside an old hulk kept for the purpose, and moored in the dock close to the market-place; tackles from a couple of davits are then hooked on to the handles, and the chest is hoisted up till nearly clear of the water, which drains through the bottom and leaves the fish dry. The cover is then taken off, and a man gets into the opening and takes out the fish, seizing them by the head and tail. As may be supposed, the commotion among fifty or sixty cod just out of the water is very great, and it is often a work of difficulty to get a good hold of the fish; but, one after another, they are lifted out and thrown up to the deck of the hulk, when they come into the hands of another man, who acts as executioner; he grasps the fish tightly behind the head with his left hand, holds it firmly on the deck, and giving a few heavy blows on the nose with a short club, kills it at once. It is sometimes as much as can be done to hold down a large and lively fish on the slippery deck, whilst giving it the *coup de grâce;* but the work is

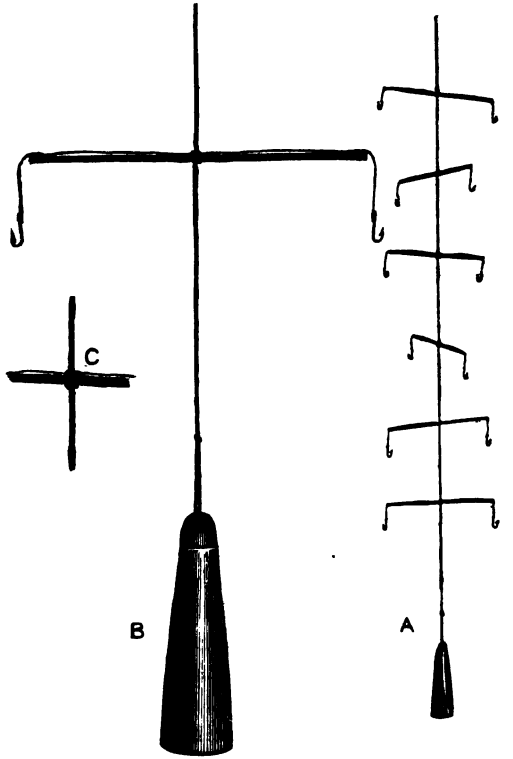
generally skilfully performed, and the dead fish rapidly accumulate into a large heap, whence they are taken to the adjoining quay, to be packed in bulk in the railway trucks waiting close by to receive them. Each truck will hold about twelve score of good-sized fish, or a proportionately larger number of smaller ones. The fish thus killed and packed reach Billingsgate in time for the early market next morning, and are known in the trade by the name of "live cod," the manner in which they are killed affecting the muscles of the fish in some way that enables the crimping process to be carried out successfully some hours after the fish have been taken out of the water. These cod command a high price, and are looked upon as essentially "West End" fish. There is, of course, a great advantage gained by thus storing the cod alive, for not only is the market more regularly supplied than would otherwise be the case, owing to small catches during bad weather, or delays from calms or adverse winds, but the fish themselves also come into the hands of the fishmongers in a fresher state than almost any other kinds supplied to them.

These two methods of line-fishing are carried on more or less around our coasts, with various modifications in the size of the hooks, the weight of the leads, the length and mounting of the lines, and the kind of bait used; the differences depending on the kinds of fish sought for, and, in the case of the hand-lines, the manner in which they are worked. Boats of various sizes are used, but they are mostly of only a few tons' measurement, especially for hand-line fishing, which is

generally carried on within a few miles of the shore. On many parts of the coast of Scotland, however, the larger boats used for drift-fishing, and now mostly decked, are also employed in the proper season for line-fishing. It should also be mentioned, as showing the different customs of fishermen on different parts of the coast, that while the Grimsby "cod-men" keep their smacks before the wind when shooting their lines, and beat up against the wind when hauling them in, the fishermen from Eyemouth, and, I believe, also from the immediate neighbourhood of the Firth of Forth, if not elsewhere, do precisely the reverse, and always keep their boats before the wind when hauling in the lines.

There is one peculiar method of line-fishing about which I may say a few words. It is called "dandy-line fishing," and in principle is much the same as that with the "paternoster," well known in fresh waters; but the line is mounted in a somewhat different manner. The line has a leaden sinker or plummet (B) of about four pounds' weight at one end, and above it, at intervals of eight inches, the line is fastened by an ordinary clove-hitch (C) to the centre of pieces of whalebone or stout wire nine inches long, having at each end a very short line terminating with a bright tinned hook. Eight or ten of these spreaders are thus fastened at right angles to the line (A), and the whole apparatus is lowered into the water and gently moved up and down, the distance to which it is sunk depending on where the herrings are supposed to be most numerous at the time, it may be but little below the

surface, or perhaps as deep as ten fathoms. No bait is used, the bright hooks being themselves sufficiently



Dandy-line.

attractive. In this manner great numbers of half-grown herrings have been taken on the Scotch coast,

especially on the eastern side. This method was at one time in common use for catching small herrings for bait on the Caithness coast during six weeks or two months before the regular drift-fishing commenced, but it has gone very much out of favour in recent years. It is still employed, however, at several places further south. I have not been able to obtain any very satisfactory explanation of the term "dandy" as applied to this line; but those who have the best practical acquaintance with the Scotch fishermen and their modes of expression believe, that "dandy" in this case has the ordinary English meaning, and a "dandy-line" is merely one which is more than usually smart and prettily mounted.

SEAN FISHING.

Among the several kinds of fishing-net in use in this country, the sean or seine has probably the strongest claim to be considered as the earliest adopted. Of the origin of any of our nets I can say very little; but there is evidence of the sean, or draw-net, having been used by some nations long before the Christian èra; and in the New Testament we read of fishing having been carried on by some of those who afterwards became Apostles, in a manner which agrees entirely with our present method of working the sean. Mr. Couch, the author of the well-known work entitled 'Fishes of the British Islands,' indeed claims a much

higher antiquity for these nets, and endeavours to show the probability of the sean having been introduced into this country by the Phœnicians, who were known to use this net; and as they are said to have traded with what is now known as Cornwall as early as the days of Moses, they may have taught the ancient Cornishmen the use of this net. It is not necessary, however, that I should go into this question, and I shall be content with acknowledging that sean-fishing is a very old method in this country, and in no part of it is it more commonly practised, or more thoroughly worked, than in the extreme west of England.

The seans used in this country are of three kinds, namely, the sean proper—sometimes called the "stop-sean"—the tuck-sean, and the ground or foot-sean. One special character, however, is common to them all—they surround or enclose the fish, and the differences between them relate almost entirely to the manner in which the nets are worked. A sean consists of a long train of netting, which may vary in length and depth according to what it is required for; but it is always deeper in the middle or "bunt" than at the "sleeves" or "wings," as the ends are called. The object of making the middle of the net deeper than the ends, is to give the enclosed fish less opportunity of escaping underneath when the net is being hauled in, as that is the part of the net where the fish congregate under such circumstances; and when the net is being hauled on shore, its gradual deepening from the ends towards the middle or bunt enables the whole of the foot or lower edge, in most cases, to touch the shelving

bottom at the same time, and so to effectually prevent the escape of the enclosed fish in that direction. The net is thrown out or shot in a semicircle if it is to be hauled on shore, or often in a complete circle, if it is intended to be worked entirely from the boats. In either case the ends are sooner or later brought together, and the fish are completely surrounded. The back, or upper edge, is well supported at the surface by corks, which is very necessary, as the fish mostly caught by the sean are those which commonly keep near the top of the water; and the foot is weighted with leads to keep it down, so that the whole wall of netting may hang perpendicularly from the corks.

There is no part of our coast where seaning can be seen more effectively worked, or on a larger scale, than in Cornwall. St. Ives has long been famed for its pilchard fishery; and, fluctuating as it has been, the proceeds are so valuable, in even a moderately good season, that for many years it has been thought worth while to keep between 200 and 300 large seans ready for work, and to take their turn in the limited space available for their proper employment. Two, or sometimes three, nets are here used for enclosing a shoal of fish, or part of it if it is a large one. The first, or principal net, spoken of as the "sean," is about 200 fathoms long and ten fathoms at its deepest part, and another net of the same kind, called the "stop-sean," is fastened to it. These nets are shot at the same time, the boats starting with them from the point where they are joined together, and in a position rather on the outside of the shoal of fish, if they are at a convenient

distance from the shore; the boat with the sean throwing out the net in a direction parallel with the shore, while the stop-sean is shot as the boat is rowed towards the beach. The two boats ultimately turn towards each other, and gradually bring the ends of the two nets together, thus completely surrounding the fish. The nets are then fastened together at the point of meeting, and the circle gradually contracted by hauling up the stop-sean until the whole of the fish are enclosed by the large sean alone. If there be a probability of enclosing a very large number of fish, a second stop-sean is fastened to the first before the circle of nets is completed; but this is only required on rare occasions, and, in any case, the fish are ultimately brought within the compass of the single large sean. When this has been accomplished, the whole circle of netting with the enclosed fish is slowly hauled towards the shore, into some quiet place out of the tide, if possible, till the foot of the net touches the bottom, and there it is securely moored. This is necessary, because the hauls of fish are sometimes so large, that several days may elapse before the net can be emptied. Now comes the operation of what is called "tucking" the fish. For this purpose another net, called the "tuck-sean," is employed. It is only seventy or eighty fathoms long, but very deep at the bunt, or middle; it is shot inside the circle formed by the large sean, and, as it is hauled in, the foot of the bunt is raised so as to get the net under the fish and bring them to the surface, whence they are taken out in large baskets and put into the boats to be carried on shore. I shall give more details

of the incidents attending this fishing when I speak of St. Ives, the great pilchard-curing station.

Very much the same mode of working the sean is in use on other parts of the Cornish coast, but generally on a much smaller scale; frequently only one net is employed, and the fish are "tucked" into the boat at once; but in that case, of course, the capture is not a very large one.

The necessity for using rowing boats in working the sean prevents its employment as a "circle-net," except near the land; it is used sometimes in deep water in some of the Scotch lochs; and in such cases the net is not grounded, but brought under the fish like a tuck-net. In most cases, however, the sean is there worked near the shore, and the net having been grounded, there is less difficulty in securing the capture of the fish. As the term "trawling" is commonly used in Scotland for the kind of fishing which in England, and, I believe, in most, if not in all, parts of Ireland, is known by the proper name of "seaning," the expression "sean-trawling" might be used when speaking of the Scotch fishery, instead of either "seaning," which would not be properly understood in Scotland, or "trawling," the meaning of which would be liable to be misunderstood in others parts of the United Kingdom.

I have now spoken of the sean proper and the tuck-sean; and I have only to describe the ground or foot-sean, in some places called the scringe-net. This sean is much more widely known than the others, for it can be very easily worked, and one of

even very small size may be the means of catching a great variety of fish. The peculiarity in its working consists simply in the net being always hauled on shore, and that being the case, there is no necessity for the meshes at the wings being as small as is desirable at the bunt or middle of the net, where the fish sooner or later collect, and the greatest pressure is felt. Each wing has a pole to which the ends of the upper and lower edges of the net are fastened, and to this pole a long drag-rope is attached for the purpose of hauling in the net. When the sean is to be shot, the end of one of the drag-ropes is left on shore in charge of some of the fishermen, and the whole of the net with the rope at the other end is put into the sean-boat, which is then rowed out from the shore, and, after shooting the net in a semicircle, returns with the second rope to the beach. The two ropes are then slowly hauled in, the two parties of fishermen gradually approaching each other as the net comes to land, until at last they meet, and the bunt of the net, in which all the fish are collected, is then drawn on shore. The ground-sean may be made of small dimensions, and is therefore very convenient for amateurs who may not be able to muster hands enough to work a large net. Yachting men frequently use it, and often procure a moderate and varied supply of fish by its means. It can be easily worked, wherever the bottom is smooth, and there is a bit of beach on which the net can be landed. At Brighton, and along the Chesil Beach, near Portland, however, nets of this kind and of a large size are regularly used in the proper season for

catching mackerel. At the latter place, a long pocket of very fine mesh is inserted into the middle of the bunt of the sean, and in this the fish collect as the net is being hauled in. The bunt is in all cases made of much smaller meshes than the other parts, as the object is to enclose the fish, and not to mesh them, as in the drift nets.

THE STOW-NET.

This is a gigantic bag-net exceeding in length the largest trawl, and is used every winter at the mouth of the Thames, in the Solent, and the Wash. It is exclusively employed for catching sprats; and numbers of these nets are worked, especially in the estuary of the Thames, from November to February. The net is like a long narrow funnel, with a nearly square mouth, the entrance being thirty feet from head to foot, and about twenty-one feet wide. From this it tapers for a length of ninety feet to a diameter of between five and six feet, and further diminishes to nearly half that size in the remaining part of the net, which, when fully made up, is also about ninety feet long. The whole net is therefore nearly 180 feet, or sixty yards in length. It is divided into several portions, the first being called the "quarters," from being composed of four distinct pieces corresponding to the four sides of the mouth; the next is named the "enter," and forms the last part of the most funnel-shaped portion of the net.

The remainder of the net is made up with from two to four divisions, the last being called the "cod," "dock-hose," or "wash-hose," and the intermediate portion or portions the "sleeves," the number of sleeves inserted into the net depending very much on whether there is a prospect of the fish being abundant or otherwise. The meshes throughout the net diminish in size from an inch and three-eighths near the mouth to from half to three-quarters of an inch at the smaller end, there being a slight enlargement of the mesh in the last part of the net. Some little variation may take place in the proportions of the several parts of the stow-net, but those I have given may be taken as fairly representing the nets used by the Thames fishermen. The smacks employed in this fishery are very commonly those used at other times for deep-sea oyster dredging, and the shrimping boats of the Thames also take part in it.

The mode of working the net is very simple. The vessel takes up a position at the beginning of the tide where there are signs of fish, or in localities where the sprats are generally found at that season. She then anchors, and at the same time the net is put overboard and takes its proper position under the vessel. That this may be effectively managed, a rope is made fast by one end to the anchor of the fishing boat before the anchor is dropped; the other is fastened to four ropes, leading each to one corner of the square mouth of the net, thus forming what is called a double bridle; and to facilitate the mouth of the net being kept open, when in the water, two wooden spars or "balks" are

fastened to the mouth of the net, one on the upper side of the square and the other at the foot. More than this, however, is necessary to keep the mouth properly open, and this essential part of the arrangement is provided for, by having a rope from each end of the upper balk to the corresponding side of the vessel, and by weighting the lower balk in order to sink it. When, therefore, the vessel has taken up her position for fishing, both vessel and net are held by the same anchor, and the depth at which it is thought best for the net to remain is regulated by the ropes from the ends of the upper balk leading to the vessel. The strain on this enormous bag-net by the force of the tide is often very great, but the net, being held by the same anchor as holds the vessel, both keep in the same relative position, even if the combined strain should cause the anchor to drag. In this position then, the vessel and net remain till the tide has nearly done, the sails being all taken down, and only one hand being left on deck as a watch to see when it is getting slack-water, and to keep a general look-out. As soon as the tide is becoming slack, all hands prepare to haul up the net. The first thing to be done is to close the mouth of the net. This is effected by means of a chain fastened to the middle of the lower balk at the foot of the mouth of the net, and leading through an iron loop at the middle of the upper balk upwards to a small davit at the bow of the vessel. By heaving in this chain, the two balks are brought close together, and ultimately raised above the surface of the water, the net with all the contained fish stream-

ing away by the side and astern of the vessel. The net is then hauled on board by a long-handled iron hook, and overhauled till the "cod" or end of it is reached. This is then hoisted in by help of a rope, which, after closing the end of the net, leads up to the vessel. This rope, or "pinion," having been cast off, the fish are measured into the vessel's hold in quantities of about three bushels at a time, the master superintending the work, and using a kind of wooden hook, called a "mingle," to hold the net in such a manner, that only a certain quantity of fish shall pass out at once. In this way all the fish in the long tube of netting, of which the free end of the stow-net is composed, are worked through the end of the cod or dock-hose into the vessel's hold. "Stow-boating," as this mode of fishing is usually called, is carried on both by day and night during the season. When the shoals of fish are of considerable size, and the captures are proportionately large, it is found that few fish besides sprats are taken; but at other times young herrings and other small fish are frequently mixed with them. The sprats are usually sold out of the fishing boats to persons who make it their business to purchase, in order to sell again to the wholesale dealers at Billingsgate, who resell them to the fishmongers, so that the price at which sprats are sold in the shops, low as it may appear, is far above what is paid to the persons who catch them. In fact, the takes are sometimes so enormous from a large number of fishing boats, that there is often a difficulty in getting rid of

the fish even for the purpose of manure, and there are hundreds, or I may say thousands, of tons disposed of every year in this manner. There is some fluctuation in the quantity of sprats caught from year to year; but there is no apparent connection between the scarcity or abundance of fish in any one season, and the success of the fishing in the previous one.

A net called a "trim-net" is worked on the same principle in some parts of the Wash; but it is very much smaller, and the mouth is of a triangular shape, three poles, the lowest of which is the longest, being fastened together at the ends so as to produce that form. It is used at the entrance to some of the small rivers, and catches smelts, eels, flounders, and other fish which frequent brackish water.

"Whitebait," which are, without the slightest doubt, nothing but young herrings, are caught in the Thames by means of a small net of much the same shape as a stow-net, and worked on just the same principle.

The only other kind of bag-net of any consequence used for catching sea fish, are long nets, which I have seen at the inner part of Waterford Harbour. They are essentially bag-nets, fourteen feet wide, eight feet deep, and fourteen fathoms long. They are fastened to the stakes of old salmon-weirs, and are used for the purpose of intercepting the sprats in their course for a short distance up the river; but the visits of the sprats to the locality being rather uncertain, the importance of these nets is not very great.

THE KETTLE NET.

This is a curious arrangement of stakes and nets, in use only in certain localities along the line of coast between Beachy Head and Folkestone. Its purpose is especially to catch mackerel when they come tolerably close to the shore, and it acts very much on the same principle as that of a fishing weir, being constructed so as to turn the fish in a particular direction, and to lead them into an enclosure in which they are ultimately captured. The kettle net is divided into two distinct portions, of which one consists of a circular row of stakes eleven feet high and eight feet apart, forming what is called the "pound," often 200 yards in circumference; this is placed so, that the outer part of the circle is just beyond low-water mark at neap tide, and the pound is completed by fastening to the whole series of stakes a train of netting reaching from the tops to the ground. Old herring-nets are generally used for this purpose, as the mackerel are too large to be caught in meshes of what is called herring-size. The pound is, therefore, an enclosure of netting supported by stakes. The entrance to the pound is made on the land side, and is about thirty-five feet wide. The other portion of the kettle net consists of a straight barrier of stakes and netting, just the same as in the pound; but it extends in a straight line from high-water mark to a short distance within the entrance to the pound, so as to act as a barrier to any fish attempting to pass between the pound and the shore. The

length of the barrier depends on what slope there is on the ground, or, in other words, on the distance between high-water and low-water marks. As these nets are only used where the tide goes out a long way, the barriers range from about 200 to 500 or 600 yards. At high water, the pound and a great part of the barrier are covered by the water, or nearly so, and the mackerel, in attempting to pass along near the shore, are stopped by the barrier; they cannot get round it at the shore end, and they naturally try in the other direction, and then, by following the line of the barrier outwards, they ultimately pass into the large enclosure of the pound. Once having entered, they are not likely again very soon to find the narrow opening; and, as the tide falls, the fish naturally keep in the deepest part of the water, until, as it approaches the time of low tide, their escape is completely cut off by the greater part of the pound becoming dry. The fishermen have then no trouble in taking out the fish. A horse and cart are driven into the pound, and the fish are either dipped up with baskets, and put into the cart, or, if much of the ground within the enclosure be still covered with water, a small sean is shot round the fish, and they are drawn on shore. I have hitherto spoken of the pound having been placed somewhere about low-water mark at neap tide; but it will be remembered that the spring tides go out very much farther, and therefore a larger extent of surface may be utilized for two or three days every fortnight. In order to make the most of this greater recess of tide, it was the practice to put up another kettle net with a shorter barrier, and a

smaller pound, outside and in continuation of the larger one, the space occupied by it lying between the limits of low water at the neap and spring tides. The obstruction to boat navigation, however, along the coasts where the nets were used, and the danger arising from the stakes extending so far out, and more or less covered by the water at about high tide, have led the Board of Trade to discourage the use of the outer kettle-nets, and to some extent of the inner ones also; for the setting up of these nets not only causes an obstruction to navigation, but completely monopolizes the whole extent of shore where they are used, and entirely prevents the sean nets being advantageously employed there. The kettle net is likewise a less generally profitable means of fishing than the seans; the former catches the fish when they go into the pound; but with the seans it is frequently possible to surround a shoal of fish which might otherwise escape; and the best policy in all regulations of fisheries is that which leads to the largest supply of useful fish to the general markets.

TRAMMEL OR SET NETS.

Two kinds of net are spoken of under these names, but they both are anchored or set when in use, and fish of various kinds become entangled in, or tramelled by, them. The real trammel, however, is peculiar in being made up of three nets or distinct sets of meshes, as is shown by its name, which in modern French is *tremail*

or *tramail*, a corruption of *trois mailles*, i.e. three meshes. In low Latin this net is called *tramallum* or *tramela*, derived from *tres maculæ*, signifying the same peculiar construction. The trammel, then, is a combination of three long nets placed side by side, and fastened together at the back, foot, and ends. Each of the outer nets or "wallings" has a depth of five meshes ten inches square, and is forty or fifty fathoms long. These two wallings are mounted so that the meshes of both exactly correspond in position, and a fish might pass through them as if they were a single net. The third net, however, is placed between the other two, and has its meshes only two inches square; but it is both twice as long and as deep as the outer ones, the excess being gathered in at short intervals along the edges where the three nets are united. The result is a large quantity of slack netting between the two outer nets. Thus prepared, the trammel is set at the bottom with its length in the direction of the tide. It is anchored and buoyed at each end, the back or upper edge being well corked, and the foot weighted to keep the whole length in a proper position.

The action of the trammel is peculiar, and is more like that of a trap than is apparently the case in other sea nets. As the outer nets or wallings stand with their meshes fully open and exactly opposite each other, and the small-meshed net hangs loosely between them, a fish, in trying to pass through the first one, meets the second, and carries a portion of it through the third, thus producing a bag or pocket beyond it. The more the fish struggles within its self-made prison,

the more it becomes "trammelled," and in its efforts to free itself, sometimes carries the pocket back through the adjoining large mesh, and makes its chances of escape still more hopeless. There is a double advantage in having a walling on each side, for a fish is thus obliged to strike the net just where the middle slack portion can be pushed through the outer large mesh, and the net is equally effective on whichever side the fish approaches it. Nets of this description are much used at Guernsey for the capture of the large red mullet, which are sent thence to the London market. It is also coming more into use than formerly on the coasts of Devon and Cornwall, and a trammel now frequently forms part of the fishing gear carried by many of our yachts. On the Cornish coast, the trammel is often called a "tumbling net."

The ordinary trammel or set-net is merely a single net mounted very slack on the head and back ropes, so as to allow a good deal of play to the netting. It is, in fact, much the same in character as the ordinary drift-nets previously described; but it is set at the bottom with anchors and buoys in just the same way as the true trammel. The meshes are made of a size suitable to that of the fish intended to be caught, as in this case the fish becomes meshed and entangled in the netting. Hake are largely taken in these nets in the south of Ireland; and it is used in different places for cod, turbot, herrings, &c., and even for crabs on parts of the Scotch coast.

ENGLISH FISHERIES.

It may be interesting to some of my readers if I now take a short survey of the fisheries carried on around the British Islands, pointing out the localities in which they have become important industries, and giving a slight sketch of the kinds of fishing most in favour in the several districts of the coast. It will be convenient to take each country separately; and the extent of coast-line, no less than the importance and variety of its fisheries, fully justifies my beginning with England.

I do not remember its having been noticed that the eastern coasts of England, Scotland, and Ireland, have generally more productive fisheries than the western coasts of the three countries. But such is undoubtedly the case. On the western coast of Ireland, the frequent bad weather, and the tremendous sea so commonly setting in upon its bold, rocky shores, with the absence, except in a few deep bays or inlets, of harbours in which fishing boats of even moderate size can find shelter, all combine to prevent systematic fishing on a large scale. The same exposed character of the coast of the outer Hebrides, which may be considered as forming a large portion of the western side of Scotland, no doubt interferes there also with profitable fishing; but great compensation is provided by

the comparatively sheltered and productive waters of the Minch, between the outer islands and the mainland. But there is no part of the coast of the United Kingdom in which there is less interest taken in sea fishing, or apparently fewer fish of any kind to be caught, than on the western coast of England and Wales—that which bounds one side of the Irish Channel. No doubt the Irish Sea is notorious for bad weather; but the Irish side of it furnishes a larger supply of fish of various kinds, than all the rest of the Irish coasts together. It may be that there is some peculiarity of the bottom on this side affecting the supply of food for the various fishes, and they are, consequently, not attracted to that coast; or there may be, possibly, objectionable warm currents setting along that shore; but the fact remains, that there are apparently fewer fish on the western side of England and Wales than on any other part of the British Islands.

Commencing, then, at Carlisle, we find, besides a little inshore line-fishing, and occasional drifting for herrings by a few boats, that trawling from the Whitehaven, Fleetwood, and Liverpool districts is the most important fishery on the north-west of England. But even the trawling grounds are only sufficiently productive at certain seasons of the year. The supply of fish on them fluctuates very much in successive years, and the trawlers are in the habit of changing their ground at regular times. The principal localities for this trawling are between the Isle of Man and the English coast, and in Carnarvon and Cardigan bays; and during the last few years, from fourteen to twenty-two

trawlers from Whitehaven and Liverpool have fished successfully in February, March, and April, on the Ayrshire coast. It is quite a new thing for beam-trawlers to work on that coast of Scotland; and as good catches have been made there of some of the best kinds of fish, it is to be hoped that Scotch fishermen themselves may in time be induced to try this mode of fishing, especially as we understand that the long-existing prejudice against it has been much lessened. Bad weather, however, is one of the difficulties to be contended with on that part of the coast; and that liability will, no doubt, interfere with the extension in this locality of a mode of fishing which is so profitably worked on many of the coasts of England. Morecambe Bay deserves some notice from its having long been famous for its shrimp fishery, and the proceeds are not only distributed through the manufacturing districts, but are sent to the London market. The ground in Morecambe Bay consists of extensive sandbanks, with innumerable channels between them, and in these the shrimpers work with cutter-rigged boats of about five or six tons, using an ordinary beam-trawl of suitable size and with a very small mesh. Twenty-five or thirty quarts of shrimps are considered a fair day's catch for one of these boats. Mussel fishing is also successfully worked on some parts of this coast. Long lines are used here in winter, and among the fish taken by them at times are large numbers of dogfish. These mischievous fish, the sworn enemy of fishermen on all parts of our coasts, are here in some cases turned to profitable account, and the fact is especially remark-

able from its being so entirely exceptional. Some of the Morecambe Bay liners prepare the dogfish for market by skinning them, and removing the head and tail. In this condition they are sold, under the name of "Darwen salmon," to the weavers at Blackburn and Preston, the only persons who can be induced to purchase them. It is the only case I have ever met with in this country, in which the hated dogfish was not knocked on the head and thrown overboard as soon as caught.

The Welsh fisheries, so far as they depend on the native population, have very little importance. Trawling is carried on at certain seasons in Carnarvon and Cardigan bays, and on the Tenby ground; but, as I have mentioned, English boats are, with few exceptions, the only ones engaged there. Drift fishing for herrings and line fishing are both worked on the west coast of Wales; but the boats in use are mostly small ones, and the supply of fish from them is barely sufficient for local demands. Independently of the general apparent scarcity of fish on this coast, the mining and quarrying industries in the Principality are of such importance, that the working population have little inducement to seek their fortune in the uncertain occupation of a sea fisherman.

The Milford oyster fishery still employs a good many hands; but, like most other oyster fisheries, there has been a great falling off in the supply in the last few years.

Tenby is the only really important fishing station on the Welsh coast; and, although there are several

trawl-smacks belonging to the place, a large proportion of the trawling on the Tenby ground is done by Brixham boats, some of which regularly work there from April to September, the only time when the fish are found there in any abundance. The trawling ground lies between Lundy Island and Carmarthen Bay. Line fishing is carried on in this neighbourhood in winter; and mackerel, herrings, pilchards, and sprats are caught by seans, but their visits are very uncertain. The oyster fishery at Mumbles or Oystermouth used to be of some importance, but it has greatly diminished, and many of the boats formerly employed in it have been sold to Brixham men for line fishing.

On the south side of the Bristol Channel, the only fishery which requires notice is that for shrimps at Burnham, in Bridgewater Bay. For this purpose bag-nets are suspended from stakes driven into the sand; and, as the nets are placed close to the ground, vast numbers of shrimps find their way into them as the tide ebbs, and, having once entered, escape is prevented by a peculiar arrangement within, on much the same principle as that commonly applied in mouse-traps, and generally adopted in the baskets or "pots" used in the west of England for catching crabs and lobsters. There have been great complaints made in past years of the destruction of small fish in these shrimp nets, and no doubt numbers of small fry have been caught in them. Complaints of this kind have been made on several parts of our coast for years past, but the evidence furnished by the immense and increasing supply

of fish to the markets all over the country, shows how utterly unimportant is the destruction complained of. It might be easily put a stop to; but the shrimp fishery would come to an end at the same time.

I will now pass on to the Cornish fisheries, there being little to be said about Barnstaple Bay, Bideford, and Clovelly, except that the ordinary methods of fishing are in use near the land, and are more or less successful according to the season, but they are never of any great importance.

The fishery which is especially associated with Cornwall is that for pilchards, and next in importance to it is the mackerel fishery; besides these there are herrings, line-fish, and a great many crabs and lobsters to be fished for, and deep-sea trawling is carried on by a few vessels from Penzance and Falmouth. St. Ives takes a very important position in connection with the pilchard fishery. It has a large fleet of fine boats which are used for the drift fishery, but it is particularly celebrated for its extensive use of the pilchard seans. Under the head of sean fishing I have given an account of the manner in which these nets are worked so as to enclose the shoals of fish, and I will now speak more particularly of what takes place at St. Ives during the seaning season.

Pilchards are included with herrings, mackerel, and sprats under the general title of migratory fish, that is, they only appear near the land during certain months every year. At other times, they are supposed to be in deep water, and possibly far away; but on these points there is literally nothing whatever known, nor can we

tell why the fish approach the land, as we find they do every year. The idea that they come in for the purpose of spawning has been quite disproved. In the case of the pilchard, the great spawning season is in the early part of the summer, before the shoals of fish come near the coast.

The pilchards visit the south coast of Ireland towards the end of the summer, and then appear to direct their course to the northern shore of Cornwall. They usually first strike that coast a little to the eastward of St. Ives, but they do not generally come in any number close to the land till they are near that town, and then, following the line of coast, they sometimes enter and work round St. Ives Bay in enormous shoals, and come within reach of the numerous seans kept there for use in this particular fishery.

The ground in this bay that is at all suitable for seaning is of very limited extent, so that special regulations are required to ensure every sean-boat having its fair chance of fishing. Moreover, the fishery is likely to be so valuable when the fish come within reach, that it is desirable to run no risk of any confusion from too many boats being at work at the same time. A special Act of Parliament was accordingly passed some years ago for the management of this fishery, and is still strictly carried out, with the approval of all the fishermen. Under this Act, the seaning ground is divided into six "stems" or stations by fixed marks on the shore; and it is decided by lot, in what rotation the various seans are to take their turns to occupy the stations. The season lasts from

the 25th of July to the 25th of December, and no sean is to keep possession of a station for more than one day at a time. At the conclusion of the day, the turn is over, whether the net has been used or not, and on the following day the next sean in rotation takes possession of the "stem," and so on throughout the season. There are also strict regulations about the dimensions of the nets, nothing less than 160 fathoms in length along the back-rope, with a depth of eight fathoms in the middle or bunt, and six fathoms at the wings, being allowed. The object of fixing a minimum size for the sean is to prevent a net being used that would only enclose a comparatively small number of fish, when it would be for the benefit, either directly or indirectly, of all the people there that the largest portion possible of the shoal should be captured; for a vast number of persons besides the fishermen find employment from this fishery, and, when once disturbed, that portion of the shoal which has not been surrounded at first, is likely to strike off into deep water and be lost. Sometimes, however, the shoals are so large, and the pressure of the fish in the direction in which the shoal is moving is so great, that they are not easily turned or alarmed, and then several seans may be used almost at the same time, each net being shot in succession as soon as the preceding one has fairly done its utmost.

The boats used for sean fishing are of three sizes; the largest of them, known as the "sean-boat," is usually about thirty-two feet on the keel, and with plenty of room in it for carrying the sean. The crew

consists of eight men, six of whom row the boat, and two shoot or throw out the net. The next in size is the "tow-boat," two of which, about twenty-four feet in length, work in company with the sean-boat, and each carries a stop-net, to be united to the sean, as previously described. The remaining boat is a small one, called the "lurker," or "volyer," from which the captain of the sean directs all the proceedings. The position of the shoals is first observed and pointed out by men called "huers," who are selected from the sharpest and cleverest of the fishermen, and are stationed at particular places above the shore, usually two men for each station, and they readily detect the fish by the peculiar appearance and colour in the water where the shoals come near the surface, and signal with a large white ball to the boats waiting below to take their turns. These men remain on duty for three hours at a time, and receive 3*l.* a month and one hogshead of fish out of every hundred hogsheads taken. The practice of measuring the pilchards by the hogshead arises from the fact of these fish being in such large demand for curing and exportation to the Mediterranean, whither they are sent packed in hogsheads. The estimate of the contents of a sean, or the actual quantity landed from one, is therefore conveniently spoken of as so many hogsheads. The work of landing and carrying the fish to the curing houses, as well as the previous operation of hauling the sean with its scaly contents into shoal water, is performed by a number of men termed "blowsers;" and it is not improbable that the heaving in of the sean-warp by

means of a capstan on the beach, work in which everyone is glad to lend a hand, may have led to the use of the expression "heav-ah, heav-ah," which is heard on all sides under such circumstances, and to which so much mystery has been attached. The seans belong for the most part to companies or large proprietors, and the fishermen receive regular pay in money and a certain proportion of the fish they have succeeded in catching. The division of the fish is made as soon as they are brought on shore, and every household does a little curing on its own account, and provides what is thought almost a necessity in Cornwall—a stock of pilchards for use in winter.

Curing is carried out on a large scale at some of the establishments at St. Ives whenever the fish are abundant, and preparations must be made accordingly; but the fishery is a very fluctuating one, depending, as it does, not so much on the abundance of fish on the coast, but on the shoals coming into localities where the seans can be advantageously worked.

The curing is the especial work of the women, who pack the pilchards in alternate layers of coarse salt and fish on the stone floor of the curing house, until the "bulk" has reached a height of five or six feet. Here the fish remain for a month, and the oil and brine draining from them are carried off by gutters in the floor to a cistern. When the fish have been sufficiently salted, they are washed and packed in hogsheads, each layer of fish being placed with their heads outwards and with a "rose" of fish in the centre; a circular piece of wood, called a "buckler," and rather

smaller than the head of the cask, is then placed on the top of the fish, and strong but gradual pressure is applied by means of a lever, until the mass of fish is reduced one-third in bulk, and a great quantity of oil squeezed from them; this drains through the sides and bottom of the cask, the hoops of which are not at that time very tightly driven, and is collected as before. The quantity of oil obtained from the pilchards depends on the season, but at least two gallons of oil are expected from each hogshead. It is principally used by the leather-dressers. The cask is filled up three times before the pressing is finished, which is not until after eight or nine days, and then the hogshead of fish should weigh four hundredweight gross. The average number of fish packed in a hogshead is about 2500. The pilchards cured at St. Ives in the early part of the season are mostly taken by drift nets, but the sean fishery at a later period is mainly depended on to provide the fish for exportation. In some years the latter fishery is almost a failure; in others more fish are taken than can be sold in one season. As many as 5500 hogsheads of pilchards were once actually saved from the part of a shoal enclosed by a single sean; but from 500 to 1000 hogsheads is generally considered to be a very good catch.

The export of pilchards is entirely to the Mediterranean, Genoa, Leghorn, Civita Vecchia, Naples, and the Adriatic being their regular destinations, and steamers the general mode of conveyance.

I am indebted to Messrs. G. C. Fox and Co., of Falmouth, for the following statistics of shipments to

the Mediterranean since 1815, and they afford good evidence of the fluctuations in the success of the sean fishery:

Year.	Hhds.	Year.	Hhds.	Year.	Hhds.
1815	15,000	1836	18,762	1857	15,921
1816	20,000	1837	15,349	1858	18,479
1817	24,000	1838	7,580	1859	3,289
1818	1,700	1839	12,856	1860	4,981
1819	2,900	1840	23,372	1861	11,078
1820	800	1841	9,605	1862	17,854
1821	2,000	1842	20,735	1863	25,677
1822	9,123	1843	8,859	1864	22,439
1823	24,109	1844	13,976	1865	9,929
1824	7,611	1845	30,807	1866	14,294
1825	12,651	1846	34,137	1867	15,832
1826	10,670	1847	41,623	1868	19,993
1827	5,238	1848	7,591	1869	15,143
1828	26,018	1849	25,588	1870	6,048
1829	700	1850	25,530	1871	45,683
1830	22,010	1851	26,736	1872	1,138*
1831	26,648	1852	15,233		18,406
1832	31,930	1853	21,276	1873	31,019
1833	10,037	1854	6,845	1874	819*
1834	25,295	1855	6,103		7,543
1835	23,833	1856	18,833	1875	7,337

In Mount's Bay, seaning is also carried on, as well as on many other parts of the south coast of Cornwall, but the nets are fewer than at St. Ives, and being distributed in suitable localities along some extent of coast, there is little occasion for the same strict regulations about working them as are practically necessary at St. Ives. Some of them, however, are by common consent adopted. Newlyn and Mousehole, close to Penzance, are the important fishing places in Mount's Bay; and it is from these villages that the celebrated Mount's Bay luggers

* Fish of previous season.

carry on the various drift fisheries for mackerel, herrings, and pilchards, which form such an essential part of the occupation of the Cornish fishermen. Three different classes of boats are used, but they are all built in the same style and rigged with large fore and mizen lugsails. The largest boats are used for the mackerel fishing, and range from thirty to forty feet, and occasionally more, on the keel, with from eleven to thirteen feet beam. The smaller boats are employed in the herring or pilchard fishing, but all are either entirely decked or have a large hatchway, which can be covered over when desirable. These luggers are all built with a sharp stern, and the mizen-mast is stepped well forward so as to allow free movement of the tiller behind it. The cost of the boats ranges according to size, from 120*l.* to as much as 600*l.* The mackerel fishery on the Cornish coast is a very important one; it begins about February, sometimes a little earlier, at some distance from the land, and continues till June. During the season, the quantity of fish sent away by railway from Penzance to the London and other markets amounts to some thousands of tons. This fishery is entirely by drift nets during the greater part of the season; but when towards the end of it the mackerel come close inshore, seans are used whenever practicable.

A new industry in connection with the pilchard fishery has within the last few years been established at Newlyn, in Mount's Bay, and at Mevagissey, farther to the eastward. This is the manufacture of "sardines," in precisely the same manner as has long been

carried out on the French coast. As there is not the slightest doubt about the French sardine being nothing but the young pilchard, myriads of which are caught every year in the Bay of Biscay for the purpose of being cured in oil under the name of "sardines," there appeared to be no reason why the same manufacture should not be attempted in other places where the same fish could be procured: and accordingly some enterprising Cornish merchants set up curing establishments at the two places we have mentioned, having taken measures to ensure a thorough knowledge of the French method of treating the fish. The result has been a great success; and I understand that orders for Cornish sardines or pilchards in oil have been given during the last two years to such an extent, that the manufacturers have had quite enough to do to execute them. The curing season is in August and September, and the fish are caught for the purpose by both sean and drift nets.

There is a general similarity in the methods of fishing along the Cornish coast, and it will be hardly necessary to say more than that, besides the important drift and sean fisheries I have spoken of, there is a good deal of general line-fishing; crabs and lobsters have long been caught in considerable numbers, although insufficient to meet the great increase in the demand for them in the London market and elsewhere; and there are a few trawlers belonging to Penzance and Falmouth, though such trawling as there is on the Cornish coast is almost entirely done by smacks from Brixham and Plymouth.

The fisheries on the Devonshire coast differ much in their respective importance from those I have just noticed as characteristic of Cornwall. We now find drift fishing less thought of, and deep-sea trawling systematically carried on. Plymouth is the most western regular trawling station, and this mode of fishing has been constantly carried on from there during the whole of the present century, and probably for some years before its commencement. More than fifty years ago there were thirty trawl-smacks belonging to the place, but they were only of half the size of those now employed. Although the size and number of the Plymouth trawlers have doubled, the increase has not taken place so much of late, and the vessels have only averaged a little over sixty in number for the last ten or fifteen years. The ground worked by them is about twenty-one miles in length and nine miles in its greatest breadth, and the largest portion of it is west of, and inside, the well-known Eddystone. It is, therefore, not far from the land; but it has the disadvantage of being exposed to the heavy sea which sets in with the frequent south-westerly gales, and it is no uncommon thing in winter for the trawlers to be obliged to remain in harbour for two or three days at a time. Much more profitable work might be done by them, however, if they had a little more energy, and devoted more time to the fishing when the weather permitted it. But old habits are not easily changed, and the Plymouth trawlers are still content with going to sea every morning and returning home in the afternoon, thus wasting half their time in harbour, and losing the night-fishing,

which is always the best for catching soles. They consequently have almost always a large proportion of "offal" fish; but this soon finds purchasers, and a great deal of all the fish landed at Plymouth is at once sent away by rail. The effect of bad weather on that part of the coast is sometimes so completely to stop all local supply to the market, that the town has been frequently dependent for its fish on such as has been sent from distant parts of Cornwall; and not very long ago, it was the fact, and by no means for the first time, that the only fish in Plymouth market was some that had been sent down from London. Such is the effect of stormy weather on the supply of fish to our markets. Trawling, however, is now carried on to such an extent on widely-separated parts of our coast, that strong winds from any one quarter do not interrupt the fisheries in every place; and when the weather is bad in the west of England, it is generally fine in the North Sea. Billingsgate is, therefore, never without a supply; but the worst time for that great market is, when a succession of gales interrupts the consignments from the hundreds of trawlers which regularly work in the North Sea. Contrary to the general rule of late years on our coasts, the second-class boats in the Plymouth Customs' district have increased, whilst those of the first class have slightly diminished. This is due to the drift and line fishing having been very successful, the latter especially having been very productive of whiting, which is in particular favour when caught by the hook. An immense quantity of drift fish is every year landed at Plymouth, that being a

convenient port for despatching the fish from by rail, if the boats happen to be fishing within some few miles of that place.

Between Plymouth and Brixham the fisheries are not of great importance, although various modes of fishing are carried on, mostly with small boats. During the recent inquiry into the state of the general crab and lobster fisheries, it was stated by a dealer of forty years' experience that there had been no falling off in the number or size of the crabs, and that those from Start Bay were the largest he had seen. It is within my personal knowledge that the value of the crab fishery in Start Bay increased immensely in value, as soon as facilities were provided for getting the crabs quickly to market, by the opening of the railway within some few miles of the fishing villages. Lines and seans are also worked in this neighbourhood.

We may now pass on to Brixham, which is an essentially fishing town, as it has been for long beyond living memory. There is good reason to believe that Brixham has a just claim to the title of the mother-port of trawling. Barking, on the Thames, is also a very old station for this kind of fishing, and a claim has also been put in for her; but, in the absence of any precise evidence in favour of either town, it is difficult to form an opinion on the knotty question. To Brixham, however, undoubtedly belongs the credit of specially encouraging the trawling system, and introducing it at other places. Ramsgate was directly colonized from Brixham, and Hull from Ramsgate and Brixham; Grimsby first became a trawling station in consequence

of a few Hull trawlers taking up their quarters there; and Brixham men and boats were the means of establishing trawling from Dublin, which led to this mode of fishing being adopted on several other parts of the Irish coast. Barking, on the other hand, has only sent boats to Yarmouth; and the superior advantages of the North Sea ports have gradually lessened the importance of Barking as a fishing station. I have said that it is difficult to obtain any evidence of the origin of trawling at Brixham, but I may safely say it has been carried on from that port for at least a century. Froude, possibly by a slip of the pen, spoke, in his 'History of England,' of there having been trawlers at Brixham in the time of Elizabeth (1588); but I can find no evidence of such having been the case, although there can be little doubt that fishing of some kinds was then an important occupation of the Brixham people. At the beginning of the present century, the trawl-boats were few and small compared with those in use now. In 1852 there were about seventy trawlers working from Brixham, and there are, probably, not less than 120 now belonging to the place, and fishing on the Brixham trawling ground during the winter season, which is the most productive one for trawl fishing. Twelve new boats were added to the Brixham fleet during 1876, and the building-yards were in the autumn of that year in full work on new vessels for Brixham and other stations. Special interest attaches to Brixham, from its being a place from which trawling has been regularly carried on for so long a time on a comparatively small extent of fishing ground. Taking

the extreme length of the trawling ground, it may be said to extend from Portland to the Start. But less than half that distance really comprises the ordinary fishing ground. If the effects of trawling were really so exhaustive as has been said, the Brixham fishery should have come to an end at least fifty years ago; but there is no appearance of such becoming the case even now, although within that period the trawlers have been nearly quadrupled in number, and more than doubled in size. The trawl fishery at Brixham was never so prosperous or so profitable as at the present day. Everyone there is more or less interested in the fishing; the actual condition of the fishery is generally understood, and the savings of the fishermen and of many of their friends are invested in it year after year. The cost of new trawl-smacks has greatly increased within the last ten years; for, not only are the new ones larger than formerly, but all the materials used in their construction are more expensive, so that the first outlay on a good vessel has risen from 800*l.* or 900*l.* to very nearly 1200*l.*

The trawlers keep very steadily at their work. Starting early on Monday morning, they return with their catch of fish perhaps in the afternoon, but more commonly on Tuesday morning. The vessel picks up her moorings, but does not lower all her sails, and without any delay the fish is landed; the men then at once return to the vessel, and she goes off to her work till the next morning; and this system continues till Friday evening or Saturday morning, when the whole fleet returns home, and stays in, till Monday comes

round again. Saturday is spent in mending nets or doing anything that may be necessary to the vessel, and Sunday is a day of rest for all hands. The fish is sold by auction: and women, at one time the only sellers, still take some part in the work. The old fashion of selling by what is called Dutch auction was the only one adopted here until within the last two years: then for some reason a change took place, and an attempt was made to make the people pay a licence-duty for selling by ordinary auction; but I believe that the Inland Revenue Board took a liberal view of the matter, and permitted the women to continue their occupation without interference, although the modern style of auction was regularly adopted.

I shall have occasion to speak of the extensive use of ice on board the North Sea trawlers; but the short distance of the Brixham trawling ground from the market makes it unnecessary for the smacks to take ice with them to sea. It is largely used, however, in packing the fish to be sent away by rail; and as fast as the trawlers come in and land their catches, the fish is sold, packed, and forwarded by the next passenger train. Most of the Brixham fish is consigned at first to Bristol, but long before it arrives there, telegrams are sent on from Brixham to direct the sending of different quantities to London or other markets, according to the orders which have been received. There are, probably, few business transactions so generally conducted by telegraph, as the sale of fish. The article is essentially a perishable one, and it is of the utmost importance to get it into the market without delay;

the network of railways and telegraphs all over the country are, therefore, of the greatest value to the fishing trade, by enabling the supplies to be sent direct to the places where the greatest demand exists. Another result from these facilities of communication and transit is the general equalization of prices; for, if fish be scarce on one part of the coast, it is, as a rule, not so everywhere at the same time, so that the inland markets are tolerably sure of a supply from one quarter or another. Still the demand is an ever-increasing one; fish cannot be supplied from abroad, and there are few people in this country who would not like to have it if they could. At present France frequently sends to our markets, and large numbers of soles and other prime fish are sent to Paris.

Brixham, although essentially a trawling station, is also interested in the line fishery, and possesses a large fleet of hookers of from five to eight tons, which do good work on the productive whiting ground along that part of the coast. It is worthy of note, that the trawlers work so much on the same ground as is fished by these hookers, that there is often a difficulty in keeping clear of their anchors; they both catch whiting, the one by hook and the other by net, and they have both regularly done so as long as can be remembered; yet the whiting season of 1876 was as productive as had been known for many years. It appears to me desirable to call special attention to these facts, for they afford the strongest possible evidence, that systematic trawling for a very long series of years over the same ground need not exhaust the supply of fish from it, or interfere to

any appreciable extent with the success of the line fishermen working in the same locality.

I need only add further about the fisheries from Brixham and other places in Torbay, that mackerel, herrings, a few pilchards, and plenty of sprats, are taken every year either by drift-nets or seans, the latter nets being especially used, and the sprats being caught by them alone.

From Torbay for a long stretch of coast as far as Sussex, the fisheries are mostly of the ordinary inshore character, consisting in a great measure of lining and seaning, the latter fishery being especially worked along that extensive line of shore terminating to the eastward in Portland, and commonly known as the Chesil Bank. The seans are here used for catching mackerel, and are of large size, being usually 150 fathoms long and ten fathoms in their greatest depth. They are used as ground seans, and are hauled up on the beach. From April to October is the general season for this fishery. We may here mention that pilchards are rarely caught on the English side of the Channel eastward of Portland, although they are said to be found much farther up Channel on the French side. We occasionally hear of pilchards as far east as the Thames, but they are not numerous even on all parts of the Devonshire coast. We must go to Cornwall or to the south of Ireland to see them in abundance, and to the Cornish coast to find out their real importance.

In the Solent the only novelty in the fisheries is the somewhat extensive use of the stow-net, described at

page 93, by the fishermen of Itchen, Cowes, and Portsmouth. It is used during the regular sprat season, lasting from November to February, and vast quantities of these fish are caught in those months, and for the most part landed at Southampton. As we proceed eastward, drift fishing for mackerel and herrings becomes more general, and Brighton and Hastings come into especial notice. The larger boats from these places go long distances to take part in the mackerel fishery, and the Brighton boats especially join with the Cornishmen at the earlier part of the season in working at the mouth of the Channel. The almost continuous line of beach along the Sussex coast requires a particular style of fishing boat for convenience in launching and hauling up where there is no harbour: they are, accordingly, built with very flat floors and large bilge-pieces to keep them upright when they are out of the water. Brighton once had a name for a class of boats in which these peculiarities were carried to excess, and they are still not entirely extinct. These, the representatives of what many years ago was the typical form of Brighton fishing boats, are known by the name of "hog-boats." They are rigged with two spritsails and a jib; but the lug-rig is now by common consent approved as that most suited for drift fishing, from the facility with which the mast can be lowered and put out of the way, and the few remaining hog-boats are now rarely used except for inshore trawling. The modern drift-boats are not only larger than formerly, but are faster and more comfortable craft.

The sean fishery for mackerel at Brighton has long been worked at the regular season, and sometimes with considerable profit; but it has always been an uncertain one, as it of course depends on whether or not the fish come close inshore.

The successful working of the kettle nets in the neighbourhood of Hastings is also subject to the same conditions. In some years enormous catches of mackerel have been made by them, whilst in others the fish have not come within their reach.

Rye Bay has long been known as excellent trawling ground during a certain time of the year. It has been worked by small trawlers as long as can be remembered, and is still productive at the regular season, when, as the fishermen say, the fish come in. Great objections were at one time raised to this inshore trawling; but, since the results of the fishery were inquired into, and it appeared that it had been carried on so long, and it was still well worth while for a considerable number of fishing boats to work there, less has been heard of the supposed injury to the general fisheries by the capture of some quantity of small fish, which always more or less takes place in shallow water.

At other seasons the Hastings and other boats trawl successfully on the long-famous Diamond Grounds, off this part of the coast; and the Varne and the Ridge in mid-Channel are much resorted to by the Dover and Folkestone boats.

Ramsgate is the next important fishing station on the coast, and it is remarkable for the steady development of its trawl fishery. Early in the present cen-

tury there were three or four open fishing boats, which were used for trawling near the shore. But about forty years ago, a few Brixham men took their smacks to Ramsgate, and the fleet of deep-sea trawlers has been gradually increasing ever since, especially during the last few years. In 1875 there were 147 first-class fishing boats, averaging over thirty-five tons, on the Ramsgate Register, and the whole of these, we believe we are correct in saying, were sea-going trawl-smacks. The home fishing ground is from north to east of the North Foreland, but in winter many of the smacks go farther away into the North Sea, and land their fish at other ports, as the neighbourhood of Ramsgate is dangerous in bad weather, and trawlers like, if possible, to get out of the way of other vessels.

The actual fisheries carried on in the Thames consist of little more than shrimping, oyster-dredging, and stow-net fishing for sprats; but London still has a considerable number of first-class fishing boats on her register, as Barking comes within the London district. Barking was once a very important station, and the head quarters of the earlier North Sea trawlers. But no smacks have been built there for many years past, and it is difficult to fix any precise time for the commencement of its trawl fishery. In my notice of Brixham, I mentioned that it was a question, to which of these two places belonged the honour of introducing deep-sea trawling; but as all records on the subject are wanting, there is every probability of the matter remaining undecided. The official returns of fishing boats unfortunately give no idea of what fishing they

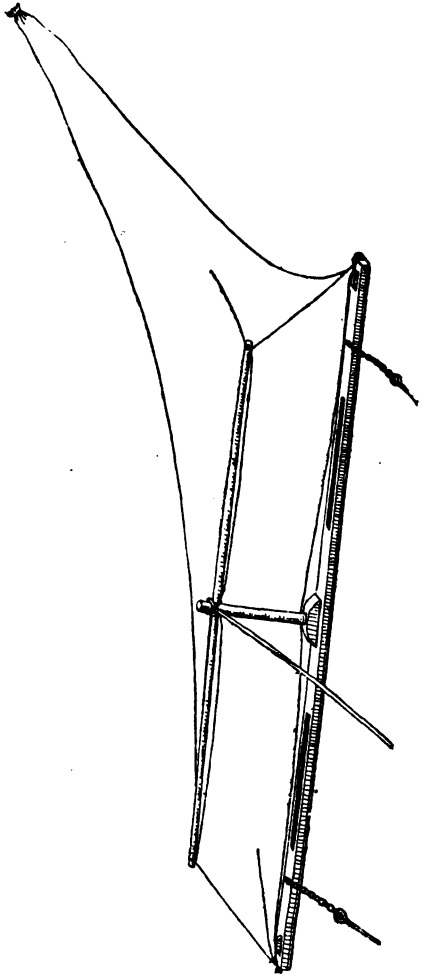
are used for; and the Custom House authorities have instructions to give no information to inquirers, owing, I understand, to newspaper correspondents having before now obtained details which were published in a form calculated to mislead the public, or to be misunderstood by them. I cannot therefore give a precise account of the number of trawlers, and of cod-boats comprised in the London return. I have been indebted to boat owners before now for approximate particulars on such points, but it will be readily understood that there are great difficulties in the way of obtaining such information, inasmuch as it involves considerable trouble on the part of those who may be in a position to obtain it; and very few business men care about collecting statistics for those, who apparently have only their own purposes to serve in seeking for them. I have mentioned these circumstances here, because such difficulties are more felt among a large community than a small one; but they interfere, in all places, with a true understanding of the subject, unless local knowledge helps to supply what is wanting. In the case of the London Returns I can venture to say, from information gathered elsewhere, that the general tendency is to reduce the number of boats registered in London, and to increase those registered at Yarmouth and other North Sea ports; for every year shows better the advantage of fishing from the nearest port; and as systematic fishing by both trawl and line is now carried on far out in the North Sea at certain seasons, and at all times largely at some distance from the land, I have reason to

think the number of boats registered in London is not likely to increase, but, on the contrary, to diminish. When new vessels are built, most of them will be registered from where they fish. There are many large salesmen in London, however, who have still some interest in Barking, and their new vessels will probably be registered in London; but if the fishing trade should continue to extend as it has during the last few years, we may look for the principal increase at the outports. In 1852, when I succeeded in obtaining precise information about the London boats, there were 149, of which 110 were trawlers and 39 cod-smacks. In 1875 the total number was reduced to 134. But Yarmouth, Grimsby, and Hull, had largely increased during that interval.

The trawl-fish sent to Billingsgate are forwarded either by rail or water carriage, depending to a great extent on what part of the coast the fish are caught, and also on the facilities afforded by favourable winds for bringing it direct to London. At some of the east coast ports, Grimsby and Hull in particular, the quantity of fish landed and sent away by rail has steadily increased. These are the places from which the numerous inland markets are largely supplied; and the smacks belonging there, which usually take such immense numbers of plaice and haddocks, only occasionally come up the Thames. London, however, is the great market for soles, and a large proportion of these fish is sent to Billingsgate, many of them to be afterwards forwarded to the country, and not uncommonly to the port where they were landed.

Steam carriers have been successfully employed for some few years past in collecting the fish from the North Sea trawlers and bringing it to London; and there are now five of these steamers kept in constant work, besides sailing vessels.

An industry of some importance of its kind has its head quarters at Leigh, a few miles above Southend. This is the well-known shrimp fishery, the proceeds of which are sent in such large quantities to the London market. The shrimp net used here for catching the brown or true shrimp, is peculiar to the Thames and its immediate neighbourhood, and is practically a beam-trawl, with a second beam below instead of a ground-rope. This lower beam is made of a stout piece of oak nine feet long, two and a half inches thick, and three and a half wide, and is weighted with about twenty-five pounds of lead run into spaces excavated on the upper side. The upper beam or pole is only six feet long, and is supported at the centre by a stout stick about a foot and a half high, which is securely fixed into the middle of the lower beam. A bag-net is fastened to these two parallel pieces of wood, and tightly strained at the ends, this framework forming the mouth of the net, which is about twelve feet in length, and tapers rapidly to the free end. The meshes are necessarily very small, so that the shrimps may not pass through. A simple but ingenious plan is adopted to prevent stones and small rubbish entering the net whilst it is being towed over the ground, and at the same time not to interfere with the capture of the shrimps. It is founded on the observed habit these ani-



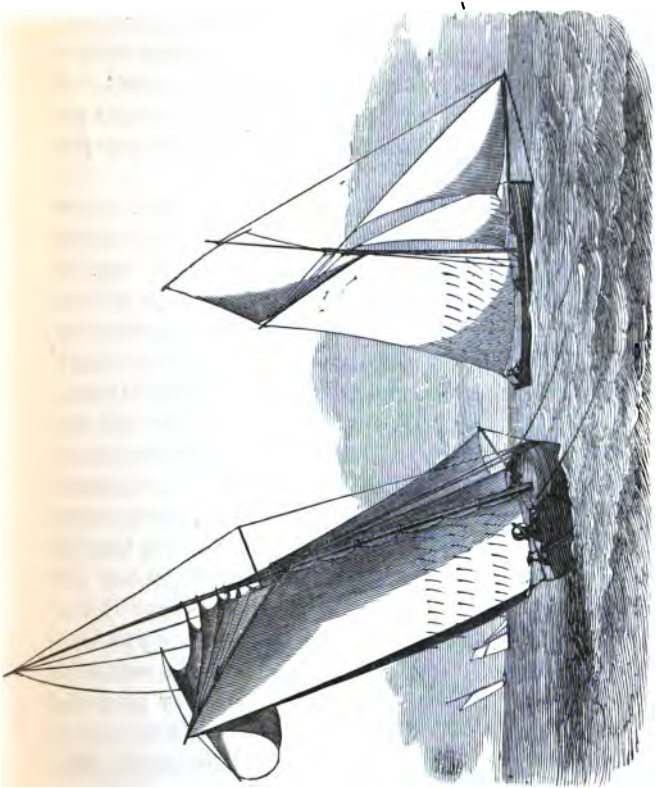
Thames Shrimp-net.

mals have of rising a few inches from the ground when they are disturbed, and consists in leaving a space of two or three inches between the lower edge of the mouth of the net, and the beam to which it is fastened at the two ends and the centre. Through this narrow opening, sand, seaweed, and such small rubbish as is likely to be met with on the shrimping ground, easily pass, whilst the shrimps spring above the gap and find their way into the net.

The shrimping boats are small-decked smacks about thirty-two feet over all; they carry a good deal of lofty sail, but for the sake of convenience have no main boom. The best season is during the early part of the summer; the shrimping is worked, however, by some of the boats throughout the year. Two or three of these nets are used by each boat, and are kept down from a quarter of an hour to an hour at a time, depending on the wind and the extent of ground they have been over. The shrimps are sifted as soon as caught, and those of the size permitted to be landed under the regulations of the Thames Conservancy are at once put into the boat's well to be kept alive till they are taken on shore in the afternoon. They are then boiled, and sent off by train in time for the London market the next morning. As many as 2000 gallons of shrimps are sometimes sent from Leigh in one day.

Some small trawlers work at the mouth of the Thames for flat fish and prawns, or "red shrimps," using the ordinary form of beam-trawl, with beams sixteen or eighteen feet long. Besides these fish,

oyster-dredging is extensively carried on over certain grounds for the collection of "spat" and "brood," to



Thames Shrimpers.

be laid down on the beds of the various oyster companies on both sides of the estuary; but the best mode

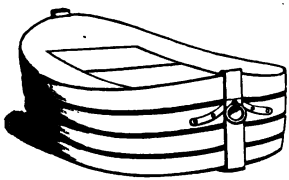
of dealing with the falling off in the supply of oysters, is a question which has not yet been settled by either theorists or practical fishermen. I have previously noticed the considerable fishing for sprats at the mouth of the Thames, when describing the construction and manner of working of the stow-net; and I need only add, that most of the larger craft at other times employed in oyster-dredging are in winter used in "stow-boating."

Northward of the Thames we come to Harwich, whose history as a fishing station is somewhat remarkable, for it exhibits a rise to a position of the first importance in connection with a particular kind of fishery, and then a gradual decline to insignificance; not because of the particular fishing trade ceasing to exist, but owing to its transfer to other ports. Harwich was at one time the great station for the North Sea cod-boats, and to her is due the credit of introducing into this country the welled smacks, by means of which the London markets have been for the last hundred and fifty years supplied with what is known in the trade as "live cod." From a statement prepared by the late Mr. Groom, an old resident at Harwich, it appears that the first welled-smack used in this country was built at Harwich in 1712, and there were three vessels of that description constructed between that year and 1715. In the year 1720, the number had increased to twelve, and in 1735, to thirty. Of that number, Mr. Nathaniel Saunders (the progenitor of the three generations of well-known fish-factors and salesmen at

Billingsgate) had six, and with four of these, which were very superior to the other two, he visited the coast of Scotland in the course of his fishing expeditions, and was at that time the chief medium for conveying goods to and from the north of Scotland. In the year 1745, his four smacks were engaged by the Government to carry the loyalist troops across the Moray Firth from Mickle Ferry to Inverness, from which place they proceeded to the memorable battle of Culloden. In 1766, a Mr. Olibar, a fishing-smack owner at Harwich, made the first attempt to fish for cod with long lines on the Dogger Bank; but although he was very unsuccessful, he still persevered, and at last was so fortunate, that in 1774 the number of smacks had increased to sixty-two, of which forty went regularly to the Dogger Bank to fish with long lines. In 1788 there were seventy-eight smacks, and in 1798 the number had increased to ninety-six. About this period a few attempts were made at Gravesend, Greenwich, and Barking, to construct smacks of a similar description, and the Harwich fishery gradually declined.

In 1852 there were only five cod-smacks belonging to Harwich, and there has been very little alteration since that date. Harwich is, however, still used as a storing place for live cod, and cargoes of these fish are regularly delivered there from smacks hailing from Gravesend and other places on the Thames, the state of that river being such as to make it hopeless to keep the cod long alive in it. The store-chests for cod at Harwich are moored in the tideway, and are

constructed on the same principle as those I have previously described as being used at Grimsby; but in order that they may offer less resistance to the stream, their ends are rounded off, giving them a somewhat boat-shaped appearance. This form is unnecessary in the quiet water of the Grimsby fish-dock, and the oblong shape there adopted is more convenient for economizing room, and entails less expense in construction.



Harwich Cod-chest.

A few deep-sea trawlers sometimes work from Harwich, and trawling for prawns is carried on along the adjoining coast. There is also some fishing in the Harwich river by means of a net called a "trim-tram," very much the same as the Leigh shrimp-net, which appears to me to be very superior for its purpose, and is probably an improved form of it. The distinguishing feature in the trim-tram is the presence of a triangular wooden frame resting on the ground in front of the lower beam, and it may answer the possible purpose of keeping the mouth of the net upright, and turning aside any rubbish which may be in front of the net; but there is an obvious disadvantage in this frame disturbing the shrimps and fish at some little distance before they can enter the net. The average quantity of fish carried annually by the Great Eastern Railway from Harwich in the last fifteen years is 2000 tons, and this has principally consisted of cod.

Lowestoft and Great Yarmouth next claim our attention, the latter especially, as it it still famous for its herring fishery, which has been carried on annually in its regular season for at least 700 years. Lowestoft has taken rank as a fishing station, only since the railway was brought to the town and the harbour was constructed; and these advantages were not obtained until within, comparatively speaking, the last few years. The following statistics will show how rapid has been the growth of the Lowestoft fisheries, consisting of drifting for herrings and mackerel, and trawling. In 1854 there were 32 fishing boats belonging to the place; in 1863 they had increased to 174, of which eight were deep-sea trawlers; in 1872, the number of first-class boats, including the larger drift-boats and trawlers, was 269, averaging 27 tons; and besides these, there were 258 drift and other fishing boats under 15 tons, and ranking in the second and third classes. The last official return is for 1875, and we there find that the first-class boats of all kinds are stated to have been 325, averaging over 30 tons, and 274 boats under 15 tons. The increase in the fishing from Lowestoft has therefore been enormous; and it will appear the more remarkable, when we take into consideration that Lowestoft is only a few miles from Yarmouth, the fisheries are of the same kind from both places, and Yarmouth shows no sign of its fishing boats decreasing. Three distinct herring fisheries are carried on from Lowestoft, and are known as the spring, midsummer, and autumn fisheries. The spring fishing is only of recent date, and very little attention

was given to it until about 1852. It is commenced about the middle of March in deep water, fifty or sixty miles from the land; but the fish are then very small, and fetch only a low price in the market, being scarcely fit for anything but manure. Nets with meshes below the usual size are necessary for catching them, and it is believed by many people that this fishing is begun much too early. As the season advances, the fish come gradually nearer the land, increase in size, put on fat, and become more marketable. This fishery lasts till the first week in May, when the fish appear to become scarce, and the fishermen get ready for the summer fishery, which requires nets with a larger mesh. The interval between the two fisheries is very short, often only a week; and when the work is resumed, the fish are found at only a few miles from the coast. The condition of these fish leads to the belief that they are only the remains of the spring shoals, as they are of the same description as those previously caught, and without any development of roe, but they are still fatter. It is difficult to understand why there should be any scarcity of fish for the short time between the two fisheries, if they really belong to the same shoals; but such appears to be the case. Some connection between them seems likely, for undoubtedly the summer fishery has several times been a short one after an abundant spring fishing, although such is not always the case. The midsummer fishing lasts till the middle of July, and the fish are in great request for the fresh market. After that no herrings are caught till the important autumn fishery begins, about the first week in

September. It has been thought that the fish then taken must be the same as were on the coast in July; but it is difficult to understand how this should be the case, or if it be so, why the herrings should entirely disappear for six or seven weeks, and then show themselves in nearly the same locality, or even farther out. It is clear, however, that there must be vast additions to their numbers, even if some of the shoals be the same, for the autumn fishery is far larger than the others, and most of the fish are in spawning condition.

The connection of Yarmouth with the herring fishery dates from the time when the first houses of the town were built, if we may credit the traditions and records on the subject; and considerable interest attaches to the fishery on that account. Without going into the earliest accounts of the fishery as given by Swinden and Manship, there is no doubt that it was well established when Henry I. granted a charter to the town in 1108. It is therefore certain that the Yarmouth herring fishery has been carried on for at least 750 years; and no more conclusive argument can be brought forward in reply to those persons who believe our fisheries are becoming exhausted, than the fact that the most abundant fisheries which have been obtained by the Yarmouth men, have been within the last ten years. It is worthy of note also, that the earliest records of this fishery speak of the fishermen and buyers assembling from various places about the Feast of St. Michael (the 29th of September) at the place where Yarmouth now stands, so that the commence-

ment of the fishery at that period was just at the same time as it is at the present day. For although the Yarmouth boats now generally begin fishing in July, they then go some distance north, and the home fishery is only carried on from September to November.

In my account of drift-net fishing, I have described the boats and nets used at Yarmouth, so I need now only say a few words about the treatment of the fish after they have been landed. The boats generally run into the haven, and land their cargoes direct at the new fish-market, which is conveniently placed by the side of the river, and can at any time be extended, if more space is required. The entrance to the haven is, however, dangerous in certain weather, and the fish is then landed on the beach in front of the town. For this purpose, large boats, called "ferry-boats," are employed, and not many years ago, all the fish was landed in this manner. These boats fetch the fish from the luggers which have anchored at a short distance from the shore. Baskets, called "swills," are used for carrying the herrings, each one holding about 500 good-sized fish. The boats return thus loaded, and are brought broadside to the beach; then two beachmen take one of the baskets between them, each supporting it with one hand in front and letting it rest on their clasped hands behind; in this way they are carried up the beach and placed in rows, two deep, ready for the sale, which takes place as soon as all the cargo is landed.

On the east coast of England, excepting in the neigh-

bourhood of Scotland, herrings are reckoned by the "last," nominally consisting of 10,000 fish, but actually of 13,200. The following is the mode of computation:

4 herrings	= 1 warp.		
33 warps	= 1 hundred	=	132 fish.
10 hundred	= 1 thousand	=	1,320 „
10 thousand	= 1 last	=	13,200 „

A "hundred" of mackerel, however, only contains 30 warps, or 120 fish.

The new fish-market was completed in 1867, and since that year an accurate account has been kept of the herrings landed there.

The following statement shows the number of lasts of fish received at the market in each of the nine years, 1868-76; and, as a "last" contains 13,200 fish, some idea may be formed of the produce of the Yarmouth herring fishery, even without taking into consideration what has been landed at Grimsby by some of the Yarmouth boats:

	Lasts.		Lasts.
1868	15,098	1873	18,796
1869	13,608	1874	17,724
1870	19,420	1875	11,820
1871	19,008	1876	12,824
1872	14,450		

The herrings are sold by ordinary auction, and are put up at so much per last; many of the curers have their own boats, and agree with the crews to give them a certain sum per last for all the fish they bring in;

and this generally answers well for both parties; but it occasionally happens that fish are very abundant, and the curers are obliged to take at contract prices all that their men catch, when the market price is much below it.

On the arrival of the herrings at the curing house, they are all washed to get rid of the salt put upon them on board ship as soon as they are caught; and then, without being gutted or any other preparation, they are again put into salt, that from Liverpool being the kind generally used. Their subsequent treatment depends on whether they are to be made into bloaters or red herrings. Bloaters are usually selected fish, full-roed, and of the best quality. The finest are made in October and part of November; but as any herring can be made into a bloater, and there is always a demand for them, their manufacture is carried on throughout the season with the best fish that can be obtained. Strictly speaking, a bloater is nothing more than a herring very slightly cured; it is kept in salt from twelve to eighteen hours, and then smoked for about twenty-four hours. At the end of that time it is fit for market, and the sooner it is used, the better will be the flavour. "Red, well-cured, or high-dried herrings," as they are variously called, are, according to the general rule, kept in salt for fourteen days, then washed, and hung in wood smoke for another fortnight. This is so contrary to the Scotch mode of curing red herrings, that I have heard doubts expressed about the curing at Yarmouth taking so long; but the time I have mentioned is strictly correct.

Under certain circumstances, however, it has been the practice during the last few years to give only half the time to the curing, and to export such fish by steamer to some of the Mediterranean markets, where they are soon disposed of; but it is not considered safe to consign any but "well-cured" herrings generally to foreign markets, especially in warm climates. Bloaters are sometimes prepared in the same way, remaining a shorter time in salt and smoke than usual, but they also will not bear keeping.

Women are employed in the curing, and the fish, after being washed, are "rived" or strung on "spits," thin sticks about 4½ feet long, which are thrust into the mouth and out through one of the gills. Twenty-five fish are put on each stick. The spits are then taken to the smoke room, a lofty room, perhaps about 16 feet square, having a series of wooden frames reaching from floor to roof, with small transverse beams, called "loves," beginning at 6 or 7 feet from the ground, and reaching from one side of the room to the other. These frames are 4 feet apart, and the spits are placed in rows, one above another, between them, the ends of the spits resting on the loves of adjoining frames. The roof is covered with tiles, uncemented, so as to allow a good draught through the room, which, when filled, contains three lasts of fish. On the stone floor of this room about sixteen fires are made, the fuel generally being oak billets, as the smoke from this wood gives a high colour to the fish. Ash timber, however, is sometimes used when a particular colour is required for some of the foreign markets. The

spits of fish having been placed on the loves until all the space is filled, the fires are lighted and kept burning for two days. They are then let out, and the fish allowed to drip or drain for a day; the fires are again lighted for two days more, and this process of alternately smoking and dripping is continued for a fortnight: at the end of that time the herrings, then thoroughly cured, are called "high-dried," and are fit for packing. This is done in barrels, two men being engaged in the operation; one, standing with the spit in his hand, tells off the fish into the barrel, sliding them from the spit four at a time. These are, for convenience, counted as two, and the packing is done by the other man as rapidly as the teller counts the 2, 4, 6, 8, 10, 12, which would represent 24 fish. When the barrel is filled to the head, a screw-press is brought to bear on the fish, and they are flattened down so as to allow an additional number to be stowed away, 650 full-sized fish being about the number packed in each barrel, or a larger number of smaller fish. The manufacturer's name and the number of fish are marked on each barrel, and the package is then ready for exportation to Italy, the Greek islands, and the Levant. For the home market the herrings are packed in flat boxes.

The mackerel fishery is carried on by the Yarmouth boats from the middle of May to the middle of July, but has not been so generally successful in recent years as it used to be. The ground worked in this fishery lies between Yarmouth and the Dutch coast. It is carried on with the same boats, and in the same

manner, as the herring fishery, and cotton is now used there as the material for mackerel nets.

Trawling has been carried on from Yarmouth for the last thirty years; but the importance of the place as a trawling station dates from ten years later, when, as I have previously related, the vessels belonging to the late Mr. Samuel Hewett first made that port their head quarters. Since that time the number of trawlers has been gradually increasing, although not so rapidly within the last few years as in the ports of the Humber. I have lately heard, however, that the increase is still going on. The system of collecting the fish from the trawlers, and sending it on shore by special vessels, has long been at work in connection with the Thames and Yarmouth smacks, as their fish, as a rule, comes to the London market. Mr. Hewett had, at one time, as many as eighteen "carriers" in almost constant work; and the same plan is still in operation, sometimes by special vessels, or at others by one of the regular trawlers, which fills up from the vessels of the fleet, generally working in the same neighbourhood at particular seasons, and giving a receipt to each smack for the number of packages she sends. Before the introduction of ice, everything depended on the carriers making a quick passage; it was racing work with them, and great was the wear and tear of canvas and spars. But the captain received a percentage on the price obtained for his cargo, and so he got every mile out of the vessel in the shortest time possible. Time is, of course, still important; but the loss of a day or two is not of so much consequence as formerly. The steam

carriers, now doing part of the work, average 2800 packages of fish in each voyage. Besides the fish sent direct to London by water carriage, a large quantity is also landed at Yarmouth and sent away by rail to various markets. Ice, for the use of the trawlers, is mainly imported from Norway, but a good deal is also procured in this country, especially from Norfolk and Lincolnshire. The number of fishing boats in the Yarmouth district, which includes very few besides those belonging to Yarmouth, has increased from 1002 in 1872, to 1018 in 1875. Of these, there were 532 boats averaging over 34 tons, in the first class, and consisting of drift boats and trawlers. The Yarmouth fisheries can hardly be considered, under all the circumstances, to be in otherwise than a thriving condition.

The characteristic fisheries of Cromer and Sheringham, between Yarmouth and the Wash, are for crabs and lobsters, and, owing to the diminished success attending them, certain restrictions as to the size of these animals allowed to be caught have been imposed by an Act of Parliament recently passed. The fishermen at Cromer have, for some years past, agreed on certain regulations as to the size of the crabs and lobsters they should keep and sell, but the effect has not been to add to the supply of these crustaceans. By the recent Act, a considerable extent of coast has become subject to regulations having the same end in view, but it is too early to say anything about the result. It is to be hoped, however, that a fair trial will be given to the Act, and that we may be able to

ascertain how far protection is of advantage, for the purpose of keeping up the supply of crabs and lobsters on our coast.

The fisheries in the Wash are of several kinds, but the most important are those for shrimps and mussels. The latter indeed are of consequence far beyond the locality, for the line fishermen, on a long stretch of coast northward, depend to a great extent upon them for a supply of suitable bait. Jurisdiction is claimed by the corporations of Lynn and Boston over the fisheries carried on respectively on the Lynn and Boston deeps; but it may be a question, whether these fisheries have derived any real benefit from being under corporate supervision. Stow-boating for sprats is one of the regular winter fisheries, and there is a small fishery for herrings carried on at the same time. Shrimps, and some flat fish, are taken here by small trawlers, and the trim-nets, previously described, are worked at times with advantage.

The coast beyond the Wash includes two of the most important fishing stations on the English coast. These are Great Grimsby and Hull. The history of Grimsby as a fishing station is so modern, that I am able to record something of its rise and progress. Its situation near the entrance of the Humber, and the advantage it consequently had in many respects over Hull, were, to a great extent, lost sight of by the trawlers, whilst the railway from the older town provided the only convenient means of sending away their fish; but it had been for several years connected with the deep-sea cod fishery on account of its situation,

and the purity of the water there compared with what was found at Hull. In fact, cod would live in store-chests at Grimsby, when they could not do so at Hull. At last some Hull trawl-smack owners thought of making the other port their permanent head quarters, as there was every prospect of the Manchester, Sheffield, and Lincolnshire Railway Company soon completing their line to the place. In 1858 five trawlers made Grimsby their regular station, and in the following year the railway was opened to the town. Since that date the Grimsby fisheries have rapidly increased, as the advantages of the port have become recognized. In 1863 there were 70 trawlers belonging to the place; in 1872, only nine years later, the trawlers numbered 248, and there were 82 cod-smacks, all belonging to, and fishing from, Grimsby. In 1875 the number of first-class boats was 392, averaging over 55 tons; these included a few small smacks used in the whelk fishery, but all the rest were trawlers and cod-boats. The average tonnage of these last two kinds of fishing boats was above 55 tons, many of them being 70 tons; and some of the vessels built in 1876 for trawling are as much as 80 tons.

The courtesy of Mr. Reed, the dock-master at Grimsby, enables me to give the following return of the quantity of fish landed at the docks in each of the twenty years, 1856–75; and although this does not represent the whole proceeds of the fisheries from Grimsby, some quantity of fish being sent by carriers direct to London, and, for some years past, herrings being landed here from some of the Yarmouth drift-

boats, it gives a good idea of the growth of the local fish traffic during the period. It must be remembered, also, that the rise of Grimsby as a fishing station has not been at the expense of Hull, as I shall presently show, for the increase of trawlers has been going on there and at other stations on the east and south coasts during the same time.

Return of the quantity of fish landed at Grimsby from 1856 to 1875:

	Tons.		Tons.
1856	1,514	1866	15,692
1857	3,435	1867	19,416
1858	4,344	1868	21,621
1859	4,742	1869	24,140
1860	4,842	1870	26,324
1861	5,371	1871	30,857
1862	8,521	1872	31,193
1863	9,408	1873	34,876
1864	11,198	1874	35,134
1865	13,368	1875	34,881

Of late years, an annual average of about 4000 tons of herrings has been landed at Grimsby from Yarmouth and Lowestoft drift-boats, but in 1875 the quantity was much less than usual. Grimsby has large docks devoted to the fishing smacks, and a covered landing wharf 882 feet long and 48 feet wide, which also answers the purpose of a fish market. This large space may be seen every morning covered with fish from one end to the other, and salesmen and buyers busily engaged in selling, buying, and packing the fish. The sales are, as usual in the wholesale market, entirely by auction. Everything has been

done at Grimsby to develop the fish trade; the ice companies have their storehouses opposite the market, and the railway trucks are brought to the side of the wharf so as to be loaded direct from the market.

On the other side of the Humber, and farther up the river, we come to Hull, which has been a trawling station for the last thirty years. There were one or two trawlers previously belonging to the port; but about 1845 there was a migration thither from Brixham and Ramsgate, and 40 trawlers fished from Hull in that year. It was soon after the discovery of the famous Silver Pit; and this led to the systematic prosecution of the North Sea trawl fishery. The success attending these vessels induced other smack-owners to settle at Hull, new vessels were turned out every year, and in 1863, the fleet consisted of nearly 270 trawlers. In 1872, the number had increased to 313. The Register for 1874 shows 357 fishing boats in the first class, and a few shrimping boats are included in this number; but the Return for 1875 shows a decrease of one vessel, and a very considerable diminution in the aggregate tonnage of the whole number. That this was a mistake was obvious to anyone acquainted with the state of the Hull trawl fishery, and I have obtained precise information from Hull showing that, so far from there having been any diminution of trawl vessels there, a considerable increase in their number took place in 1875, and large additions were being made in 1876. The largest smacks at Grimsby and Hull in 1872 were 70 tons; but some of the

vessels now building for the same purpose are as much as 80 tons.

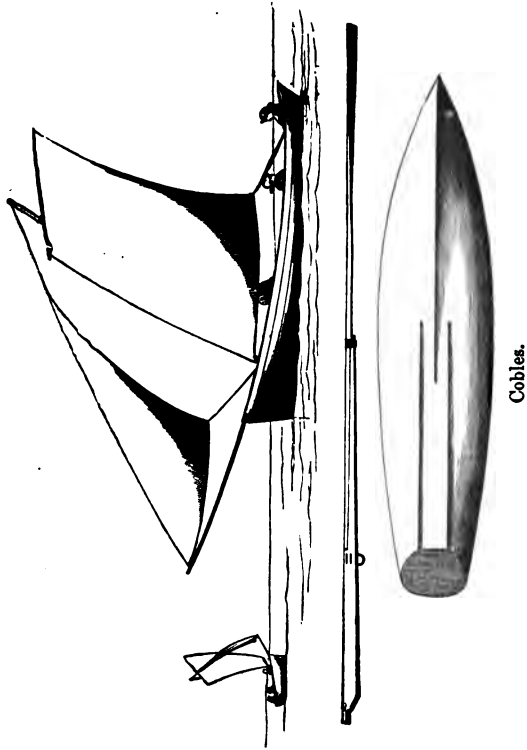
Before ice became so generally used as it is at present, the Hull smacks usually fished in fleets, and sent their fish in every day by whichever vessel was going home. Each vessel then stayed out for six weeks at a time, and there was a constant succession of smacks joining and leaving the fleet. When a vessel's turn came to go home, she hoisted a flag, and all the others sent their fish on board, carefully packed in baskets, with a fish-note containing particulars of their number and contents as delivered by each vessel. On her arrival at the Hull docks, she was placed under a steam-crane, and the fish hoisted out, the master handing in his manifest or "pot-list," as it was called, so that each salesman might know what fish was consigned to him, and from which vessels it was sent. But about twelve years ago, when the advantage of the use of ice had become evident, twenty of the Hull smacks were fitted as "ice-cutters" to collect the fish, and carry it partly to Hull and partly to London; and these are still kept at work from May to September, the trawlers during that time fishing in fleets of from twenty to fifty vessels. From September to May, however, quite a different system is adopted, for there is generally no want of wind then, and each vessel brings in her own catch. An air-tight compartment is fitted in the hold, called the "ice-box," in which from two to four tons of Norwegian ice are placed when the smack starts on her trip. As the fish is caught it is

stowed away in bulk, with broken ice between each layer, and this is continued till a good quantity of fish has been collected. Then the vessel returns to port, after an absence of, perhaps, ten or fourteen days. The fish are taken out loose and all sold by weight, the buyer finding the packages: those now regularly used being small barrels holding about ten or twelve stone of fish, and called "kits." In these the fish are packed with alternate layers of crushed ice, and then forwarded to the fishmongers all over the country. Pads, trunks, and pots—as the old-fashioned measures were called—are quite gone out of use at Hull, and are becoming more so every day at other places. The ice now annually used at Hull in connection with the fisheries is about 25,000 tons.

A considerable number of small craft belonging to the second class, find employment in the Humber and along the coast to Flamborough in shrimping or line-fishing, and in Bridlington Bay in trawling for flat fish, but there is nothing in these fisheries requiring special notice.

From Flamborough northward nearly as far as Holy Island, the peculiar boats called "cobles" are in regular use. They vary a good deal in size, but are all built on one principle and with one object, that of readily beaching, stern foremost, in a surf. The bow is built with a considerable rise, and is sharp and hollow below, but the keel extends only for a little more than half the length of the boat. The after-part of the bottom is flat, with a runner or false keel on each side of the central plank, and carried so far for-

ward as to overlap the end of the true keel from the bow. The result of this construction is that the coble can be backed up with great facility on the beach, the



Cobles.

flat keel-plank and false keels keeping her steady and upright, whilst the hollow bow throws off the waves which may be beating her on the shore. These boats

are built with broad planks, and the two upper ones "tumble in" at the quarters, giving the stern a boxed-in appearance. They are very useful boats, and will stand a good deal of bad weather, but are rather dangerous when running before a sea. The fashion has long been to paint the cobles in stripes of yellow, green, and red, thus giving a still more quaint appearance to these peculiarly constructed boats.

Crabs and lobsters are caught all along this range of coast in creels or cages having a rectangular bottom, and the top rounded, with the usual mouse-trap openings at the sides; the whole framework, except at the entrances, being covered with netting. A variation in the form of trap is, however, adopted at Flamborough, and it requires much more skill in using it, but it will take larger lobsters and crabs than the others. It is called a "trunk," and consists merely of an iron ring about two feet across, with a shallow net suspended from it. The bait is fastened in the centre to a cross line, and three lines placed at equal distances from each other on the ring unite above to form a handle, to which is fastened the rope used in lowering and raising it. A number of these trunks are lowered to the bottom, in suitable localities, and after a time are hauled up. It is in the raising of the trunks that the difficulty of working them properly consists, for the top of the trunk is quite open, and anything within it may easily escape. The greatest care is therefore necessary, especially just when it comes to the surface, as at that time the lobsters are apt to make a sudden spring backwards and clear the ring.

Along the north-east coast of England the fisheries are mainly for herrings by drift nets, and cod, haddock, turbot, holibut, coalfish, and some others by long lines. An exception occurs, however, at Scarborough, which is a trawling station, and takes precedence of Hull in that respect by about ten years, although it is now far behind it in importance as regards both the number and size of its fishing boats. The Scarborough fisheries, in fact, include several kinds, and the same boats are used for each in turn. The regular trawl-smacks at Hull are specially built for one purpose, and all the energies of the fishermen are engaged throughout the year in that one object. It is not surprising, therefore, that in the matter of trawling, Scarborough has been left behind, although her first-class boats have continued to increase during the last few years. The inshore fisheries along the Northumberland coast have been subject to fluctuations at various times, which have led some of the fishermen to bring charges of destroying spawn of different kinds against the deep-sea trawlers; but it is due to them to say, that when these charges were brought against the deep-sea fishermen, no one was aware that the spawn of cod, haddock, plaice, and most probably the other kinds of flat fish, was not deposited at the bottom, but floated freely in the water. That there was not the slightest evidence of spawn having been destroyed, probably did not affect the belief of those fishermen who expressed themselves so strongly on the subject; but if fish had at various places become as scarce as was alleged, it is clear some other explanation of the failure must be

sought. A few years afterwards the scarcity of bait was the great cause of complaint, and near the Tyne a profitable salmon fishery on the coast led to the herring fishery being neglected.

In the neighbourhood of Holy Island and northwards, a class of boats distinct from the cobles is employed. They are known as "keel boats," and are of very much the same build as the general run of Scotch fishing craft. At Berwick-on-Tweed the fisheries are essentially the same as at the fishing stations in the Firth of Forth, which I shall speak of presently.

Crabs and lobsters are fished for on all the rocky parts of this coast, and, according to the evidence given during a recent inquiry there, the supply is not so good as formerly.

SCOTCH FISHERIES.

The sea fisheries on the coasts of Scotland are very important, but they mainly consist of two kinds—drift fishing for herrings in summer, and line fishing for cod, ling, haddock, and other fish more or less at other times. Besides these, there is seaning (called "trawling" in Scotland) for herrings and sprats in some localities; a few set-nets are used in others, and there are several places in which crabs and lobsters are regularly worked for. Beam-trawling is in very little favour in Scotland; and it is only within the last very few years that anything has been done with it in deep water, and then mostly by English trawlers.

I have already spoken of the change which has largely taken place, and is still going on, in the Scotch fishing craft, by the substitution of decked for undecked boats, principally in those of the first class. An increase in the size of the boats has been made at the same time; but the alteration in this respect has been limited by the general absence of deep-water harbours in Scotland, unless specially constructed. The fishing harbours on the east coast, where they are more particularly needed, are, with two or three exceptions, very small, and only suitable for boats which will just go into the first class, or for smaller ones.

The result is, that although the first-class boats in Scotland have increased more than 20 per cent. within the four years, 1872–75, their average size in 1875 was only 17 tons, and among them were sixty cod-smacks belonging to Shetland, and averaging 45 tons each. The general Scotch fisheries are in deep water, but this is found not far from the land; and the boats are able as a rule to go to sea and return every day. The use of ice in these fishing boats is, therefore, unnecessary, and, I believe, is never thought of. The tendency of the fishermen is to go farther to sea than formerly, as they find the advantages in larger catches.

Commencing our notice of the Scotch fishery stations with the Firth of Forth and its neighbourhood, we find several places important from the number of fishing boats belonging to them, and the quantity of fish landed there. Berwick is practically a Scotch town so far as regards its fisheries; and although, as a Customs district, it appears on the English list, it includes Eyemouth, Dunbar, and intermediate villages within its limits. The fisheries along this range of coast generally, are more varied than is usual in Scottish waters. The great herring fishery is carried on from July to September, and during this period large quantities of these fish are landed at Dunbar and North Berwick, also from the other side of the Firth, and are sent off by rail to the fish market. Newhaven has long been know as a thriving fishing station, and its boats, for many years the best on the coast, have shared in the improvements which happily are becoming every day more widely adopted, whilst the New-

haven fishwives, with their picturesque costumes and marvellous powers of work and tongue, still find plenty of employment in helping their relatives, although their labours in the disposal of the fish have been much lightened since the construction of the coast line of railway. Fishing with long lines is extensively carried on from this place, and the lines in use are of two sizes, those for cod and haddock. The haddock lines carry from 800 to 1000 hooks each, on snoods 14 inches long and 2½ feet apart, and mussels and lugworms are used as bait. The number of men in a boat depends on her size, and whether the fishing is carried on near or far from the land. The smaller boats are used for the haddock fishery, as this is more worked at no great distance from the coast. There is a considerable trade in smoked haddocks, particularly from Eyemouth; and the curing consists in soaking the fish in pickle for half an hour, and then hanging them for four hours in some hardwood smoke.

The haddock fishery from Eyemouth was very successful in the early part of 1876. The largest boats were used, with seven men in each boat; and in one week in January the boats were six times at sea, and landed 20,000 stones of haddocks, which sold at an average price of 2*s.* a stone, thus producing in that short period no less than 2000*l.* The haddock fishing season lasts here from October to April, and the average gain by each boat for the season usually ranges fron 400*l.* to 600*l.* I have received this information from persons, whose business it is to make themselves thoroughly acquainted with the results of

the fisheries, and who can see for themselves what is really being done.

The cod or "great lines" are worked at considerable distances from land, and although on precisely the same principle as the haddock lines, have fewer and larger hooks, which are fastened to snoods 5 feet long and 2½ fathoms apart. Small haddocks and herrings are used as bait, and cod, ling, skate, turbot, and holibut are the fish caught by them. The number of lines in a boat varies with the number of men, each of whom has one; and the lines are all fastened together into a "string" when they are shot. A winter herring fishery has also been carried on in the Firth of Forth during the last few years, but it is liable to much interruption by the prevailing bad weather at that season, and varies accordingly. The sprat fishing by seans, or "trawls," takes place at the upper end of the Firth, when the fish come in during the winter. As with all fish which only come under notice at a particular season, the supply of sprats fluctuates from year to year; sometimes being so abundant that they can hardly be sold at any price, and at others producing large profits to the fishermen from a short supply.

On the north side of the Firth there are many fishing villages, all taking part in the characteristic fisheries of the district; and important harbour works have been carried on for many years past at Anstruther for the special benefit of the fishermen. An annual grant of money from Parliament has for some time been applied to the construction of this harbour; but the work has progressed slowly, and so much damage has been done

to the half-finished piers at various times by bad weather, that further assistance from the Treasury, in order to bring the work to completion, seemed by the last Report of the Board of Fisheries to have been thought necessary. It is along part of this side of the Firth, and a little northwards, that beam trawling in comparatively shallow water is carried on at times; but it is on such a small scale, that it does not require much notice.

From the Firth of Forth northward to Frazerburgh, the fisheries are as usual by drift net and line; but several important stations are met with on this range of coast, where the herring fishery is prosecuted with considerable success. Montrose, Aberdeen, Peterhead, and Frazerburgh may be mentioned as being stations for large fisheries, and the last two have in recent years taken the principal position on the east coast for the extent of their curing operations. Before speaking of these places, however, I should mention that this part of the east coast has long been famous for its haddock fishery, and that at the village of Findon, between Stonehaven and Aberdeen, the preparation of the celebrated "Finnan haddies" was first attempted. The peculiarity in the fish cured there, and which has brought them so much into favour, is that they are hung in the smoke of peat fires. By this operation the fish acquire a peculiar flavour, which enables them to fetch a higher price than the ordinary smoked haddocks which are largely prepared at Grimsby and many other places both in England and Scotland. The name of "Finnan haddie" is so popular, however,

that it is to be feared that what should be simply called "smoked haddocks," are very often made to do duty in the shops for the superior article.

The herring fishery from Aberdeen has been very much developed in recent times, and I believe to that town belongs the credit of first utilizing steam in connection with the drift fishery. In 1871, steam-tugs were employed for the purpose of helping the drift boats to and from the fishing grounds. There can be no doubt that this was a move in the right direction, and that the Scotch Fishery Commissioners were quite justified in their remarks on the subject when they said, in their Report for 1871: "In the absence of direct application of steam to fishing boats, which it may be prognosticated will be introduced before many years have passed, the employment of a steam-tug by the fleet cannot be too much extended. As a resource of modern times, it overcomes the hindrances and difficulties of a coast where the tides are rapid, and the winds variable and often light; indeed, it is impossible too strongly to recommend a force which so easily surmounts these and other obstacles, and, by taking the boats long distances, opens new fishing grounds."

There are many difficulties, however, in the way of thus using steam, which, I fear, will prevent any general adoption of the system, notwithstanding its undoubted advantages. In places like Aberdeen, where there is always a large amount of shipping, there may be little difficulty in obtaining the services of one or two steam-tugs when the fishing boats require them. But it is very different at the places where the fisheries

are the only occupation of the people; and this is generally the case at the fishing stations. It would be necessary to charter steam-tugs for the fishing season, and very often to keep them idle; and the expense of providing tugs sufficient to be of material use in towing some hundreds of large boats to and from the fishing grounds, would necessarily be very great.

The system has been tried, however, at three or four places, but only on a small scale; and I fear there is very little chance of its being carried out to the extent it might be, unless the expenses can be materially diminished.

The question of applying steam power directly to the fishing boats has also been considered, but that would involve even greater expense. The experiment has been tried with deep-sea trawlers, and the system seemed particularly applicable to that mode of fishing, in which a certain regular speed is desirable; but although, as I can testify from personal observation, the work was done well under steam, and there was a great saving of time and labour in various ways, the expenses were found to be too heavy to make steam trawling anything but a loss. At the present time, steam in connection with fishing is profitably employed in the carriers which collect the fish from the fleets of North Sea trawlers and bring it to market, as I have previously mentioned; but in no other way does it appear that it can be yet systematically used with advantage and profit.

The importance which has been attained by Peterhead and Frazerburgh in recent years, both as fishing

and curing stations, may be seen by the following figures taken from the official returns published by the Fishery Board of Scotland. They show the number of boats fishing from those stations during the season, including those belonging there, and boats from other parts of the coast; the number of fishermen employed in them, and of the various persons engaged in curing the fish landed there, with the total number of barrels of herrings cured in each of the five years 1871-75.

Return of Boats, Fishermen and Curers, with the number of Barrels of Herrings cured, at Peterhead and Frazerburgh, in the years 1871-75:

PETERHEAD.

Year.	Boats.	Fishermen.	Curers.	Barrels.
1871	630	3,425	2,132	150,251
1872	705	3,876	2,291	178,060
1873	780	4,468	2,616	209,851
1874	746	4,200	2,841	219,858
1875	730	4,380	2,846	205,305

FRAZERBURGH.

1871	547	2,948	1,977	154,467
1872	773	4,276	2,730	218,202
1873	772	4,315	2,932	216,476
1874	823	4,803	3,235	253,130
1875	905	5,429	3,572	284,284

The method of curing the fish at Peterhead and Frazerburgh, as well as at the fishing stations all round the coast of Scotland, is that known as the "British White Herring Cure," and consists simply in

packing the herring with a certain proportion of salt in well-made barrels, where they remain till they are required for consumption. The process, however, needs considerable care, and it is considered important that the curing should be commenced as soon as possible after the fish are caught. No time therefore is lost in bringing the fish on shore; and after having been measured in a stamped vessel holding 37½ gallons, and known as a "cran," they are at once taken in hand by the gutters, who perform their duties with a marvellous rapidity, only to be attained by considerable practice. This part of the work is almost entirely done by women. As soon as the fish have been gutted—and for this purpose it is only necessary to make a small opening near the head—they are placed in large tubs, where they are well "roused" or stirred up with a good supply of salt, so that it may be applied to their whole surface. The fish are then carefully packed with alternate layers of salt in barrels of regulated size, and after remaining ten clear days in pickle, the barrels are filled up as necessary, and finally closed. If, however, they are intended for exportation to a warm country, the barrels are repacked in the same manner as at first.

The herrings for curing are separated into four classes, consisting of "Full," or fish having large milt or roe; "Maties," or fat fish, and with the roe undeveloped; "Spent," or shotten, those which have recently spawned; and "Mixed," consisting of unassorted fish. The whole process of curing is carried on under the supervision of the officers of the Scotch Fishery Board,

or, properly speaking, the Board of British White Herring Fishery. This mode of cure, now, I believe, entirely confined to Scotland, is required by Act of Parliament to be carried out under inspection; and if the result of the cure come up to a certain standard of excellence, the curers can have, on payment of fourpence per barrel, a Government brand placed on each barrel so approved. The branding is quite optional on the part of the curer; but in either case the curing must be open to inspection, and barrels of a particular size must be used for packing the fish in. It is one of the anomalies of the system, however, that although it is absolutely forbidden to use barrels of other than a certain size, there is not the slightest restriction as to the quality or condition of the fish to be packed in the barrel, so long as the Government brand is not desired for it. Any refuse fish may be cured and packed, but the barrel must be of a certain size. There are four distinct brands in common use, denoting the quality and description of fish cured; but the Crown Full brand, given only to "full" fish properly cured, is the one mainly in request. The advantages and disadvantages of the branding system have been often discussed, and I need say nothing more on the well-worn subject, except that it appears to greatly facilitate the sale of "white herrings" in the Continental markets, where there is always a large demand for fish cured in this manner. On the other hand, a Government certificate of the quality of any particular article of commerce is opposed to the policy of free trade now adopted in this country. Branding is, however, in

favour with an increasing majority of the curers for such fish as they send abroad, but only on the east coast and at the northern islands; the curers on the western side not liking to keep the fish in pickle for the number of days required to enable them to obtain the brand. The explanation of this is, that the western fishery begins earlier than that on the east coast, and the curers there are anxious to send their fish to the Continental markets as soon as possible. Previous to 1859, there were no branding fees, and it was thought that by imposing them, the branding system might lose favour, and ultimately be done away with; but the result has been otherwise, as will be seen in the following tables.

Return of the number of Barrels of White Herrings Cured, Exported, and Branded, with the Branding Fees received in the years 1859-75:

Year.	Cured.	Exported.	Branded.	Fees.
				£
1859	491,487	272,979	158,676	2,644
1860	681,193	377,970	231,913	3,865
1861	668,828	390,313	265,347	4,422
1862	830,904	494,910	346,712	5,778
1863	654,816	407,761	276,880	4,614
1864	643,650	364,507	217,392	3,623
1865	621,763	352,701	216,785	3,613
1866	658,146	380,066	249,510	4,158
1867	825,589	478,704	317,421	5,290
1868	651,433	368,744	209,462	3,491
1869	675,143	381,333	244,522	4,075
1870	833,160	530,558	299,381	4,989
1871	825,475	551,605	346,633	5,777
1872	773,859	549,631	422,731	7,045
1873	939,233	668,008	435,274	7,254
1874	1,000,561	737,314	517,558	8,625
1875	942,980	660,970	523,789	8,729

In the Moray Firth, among several stations of more or less importance, Buckie deserves notice, no less for the industry and enterprise of its fishermen than for the peculiarity of the boats used by them. The general character of the Scotch fishing boats, especially those on the east coast, is to have both ends sharp, a good deal of beam, and a moderate rise of floor. They used to be entirely open, and were rigged with a jib, and fore and main lugs. The change, now very general, from undecked to decked boats has necessitated an alteration in this rig, the mainmast being done away with, and a mizen carried instead, the fore-lug being made with a large foot as in the luggers belonging to Yarmouth and most other English fishing ports. The Buckie boats, known as "Scaffs" or "Scaffy boats," are of an entirely different build from the other Scotch craft; they have a flat floor, a long hollow bow, with the greatest breadth at the water-line very far aft; the stem and sternpost rake a good deal, and they have plenty of beam and room on board. In addition to these peculiarities, they carried a mizen as well as fore and main lugs, but I have never observed them with a jib. They are considered fine sea-boats, and the Buckie men are accustomed to go away long distances in them for the purpose of line fishing, which is their favourite occupation, and takes them sometimes to the Orkneys and other places far from their homes. The advantages of a decked boat are now thoroughly understood by these men; and in the last few years they have built all

their new first-class boats with decks, at the same time doing away with the mainmast, and carrying a larger fore-lug. The little artificial harbour at Buckie affords shelter to a good number of boats; but, like many other harbours on this exposed coast, it is a dangerous place to enter at certain times of tide, and often in weather when a safe refuge is most to be desired.

In the Beauly Firth, sprat-fishing is successfully carried on, subject to the usual fluctuations in the abundance and size of the shoals of fish.

Wick, nearly at the north-east point of Scotland, is the largest curing place after Frazerburgh, and for many years occupied the first position as a herring station on the east coast. Its situation particularly exposes it to the effects of the winter storms, and deep-sea fishing in that neighbourhood, whether by net or line, is both dangerous and uncertain at that season. It is hardly less so sometimes in summer; for any difficulty there may be in finding shelter under ordinary circumstances is greatly increased by the large number of fishing boats then working from that station. The construction of a deep-water harbour, and easily accessible in bad weather, is therefore a matter of the greatest importance to the fisheries; but, notwithstanding the large sums which have been spent by the British Fisheries Society, who have a property in the harbour, and further sums advanced by the Public Loan Commissioners, hardly a winter passes without much damage being done to the piers by the tremendous force of the waves which roll into the bay during

the terrible north-east gales. In the last winter of 1876–77, when wrecks strewed our coasts, and the North Sea week after week added to the list of disabled and missing ships, Wick harbour has been exposed to a succession of bad weather, the effects of which are reported as having been more disastrous and destructive to the piers than on any previous occasion. It will be an engineering triumph when the harbour is properly completed; but it would seem almost impossible to construct any piers there that can withstand the forces to which sooner or later they must inevitably be exposed. Great as is the importance of a harbour of refuge at Wick for the hundreds of fishing boats which at the different seasons make that place their rendezvous, it would be of no little value also to larger shipping which risk the passage through the dangerous Pentland Firth, and which now have no place of refuge in the neighbourhood, when caught in bad weather on that coast.

Besides the regular herring fishery from July to September, Wick has also a small winter fishery for herrings, frequently interrupted, however, by bad weather; and cod, ling, and other line-fish are also worked for at the proper season.

I may now say a few words about the Orkneys and Shetlands, islands whose fisheries are especially subject to the difficulties arising from the combination of bad weather, deep water close inshore, and very rapid tides; and yet whose fishermen, particularly the Shetlanders, are as daring and enterprising as any in the

United Kingdom. The Orkney fishermen frequently work with those on the Scotch coast during the herring season, as well as in their own immediate waters, where much uncertainty attends the drift fishing. Here, however, line fishing for cod, ling, and coal fish occupies a good deal of attention; and haddocks are also caught, though the numbers of these fish vary much in different years. The Orcadians are not such thorough-going fishermen, taking them altogether, as the Shetlanders, and the objectionable, but sometimes necessary, diversion of a good deal of their time to the cultivation of the land, prevents their devoting as much attention to the fisheries as they might otherwise give. Dried cod and ling may be looked upon as the most valuable products of the Orkney fisheries, and there is a considerable demand for these fish in the Spanish market. Lobster-fishing has always been a profitable occupation in these islands, and it is said to have been the only one carried on there previous to 1815. The lobsters are now packed alive with seaweed in boxes, and forwarded by steamer to Aberdeen, and thence to London. Formerly they were carried away in welled smacks, and, although longer on their journey, they generally reached the market in better condition than they do under the present system. Crabs are also abundant, but they will not bear packing in the same manner as is adopted with lobsters. The larger Orkney boats are now decked, and of the same style as those on the Scotch coast; but the skiffs, used for line fishing, are much smaller and quite open. They have a crew

of from two to four men each, and carry a jib and two large lugs, the foot of the latter being extended by means of a boom.

The Shetlands form the northern limit of what may be called our home fisheries; for, although vessels, fitted out at Shetland, as well as Grimsby smacks, go every year to the Faroe Islands, and sometimes to Iceland for cod, and bring their captures home, this fishery cannot be considered as strictly belonging to our own coasts. The great fishery at the Shetlands is, however, practically by lines; and cod, ling, saithe or coalfish, and tusk—quite a northern fish, and resembling a short-bodied ling—are the species specially sought after. There is also some drift fishing for herrings, but these fish are very uncertain in their appearance on the Shetland coasts, and the dangerous character of the sea there, and the frequent bad weather, often interfere with regular herring-fishing. Besides these difficulties, the greater importance of the line fishing induces most of the fishermen to devote as much time as possible to that kind of work.

The line fishery is also subject to a good deal of fluctuation, especially as regards the cod, which, not only at the Shetlands, but also at Faroe and Iceland, become abundant or scarce in successive seasons without any apparent cause. Saithe are taken by hand lines near the coast, and commonly close to the surface. Cod are also taken in the same manner; but most of them are caught at some distance from the land, and there are particular banks which have long

been famous for their general productiveness. Of these the Foula Bank, between Foula Island and the mainland of Zetland, is a favourite resort. I have already referred to the cod fisheries at Faroe and Iceland, and, although they are not home fisheries, they are worked by our own fishermen, and a considerable number of vessels, each carrying about fourteen men, are fitted out every year at Lerwick for this particular service. The fishing season is from April to September, and during that period the smacks make two or three trips. Welled vessels are not needed for this work, as all the fish are cured; they are split and salted as soon as caught, and on the vessel's return to Shetland, the fish are washed, and then dried in the open air. They undergo no packing, but are exported in bulk. Many years ago there was a Government bounty on all the fish thus cured, and then it was the practice to punch those of which an account was taken. Fish cured wet were put into pickle, and the barrels were branded; but all bounties ceased in 1830, and there has been no punching or branding since 1850. Now, the quantity of cod and ling landed at, cured, and exported from the Shetlands and Scotland generally, is only ascertained approximately by the officers of the Scotch Board of Fisheries, but the returns prepared by them are probably not very far from the truth. I may here give an extract from these returns for the last ten years, so as to give some idea of the importance of these line fisheries in Scotland, the Orkneys and Shetlands being included in that part of Great Britain, and, until 1869, the Isle of Man also.

Abstract, showing the total quantity of cod, ling, saithe, and tusk cured and exported in the years 1866–75:

Year.	Quantity Cured.		Quantity Exported.
	Dried.	In Pickle.	Dried.
	cwts.	barrels.	cwts.
1866	115,819	9,957	47,753
1867	119,638	10,819	46,225
1868	113,831	9,659	52,403
1869	135,585	10,319	51,864
1870	145,288	9,945	56,400
1871	119,030	9,283	54,171
1872	145,976	11,940	53,631
1873	160,716	12,381	70,101
1874	143,466	6,754	60,913
1875	187,788	8,503	81,880

The average number of fish required to make up a hundredweight in the dried state may be roughly estimated by the returns for Shetland alone in 1875, when there were 3,458,799 fish landed, and these produced 111,812 cwts. of dried fish.

The Shetland smacks are not the property of the fishermen, but are fitted out by the curers, the men receiving half the catch, or its equivalent, after all expenses are paid; they are also provided with bread by the owners. At the close of the deep-sea cod fishery, these smacks are laid up for the winter, and the crews seek some other employment; but the winter days in that northern region are too short, and the weather commonly too stormy, for much fishing to be done on the coast. Some of the Grimsby cod-smacks,

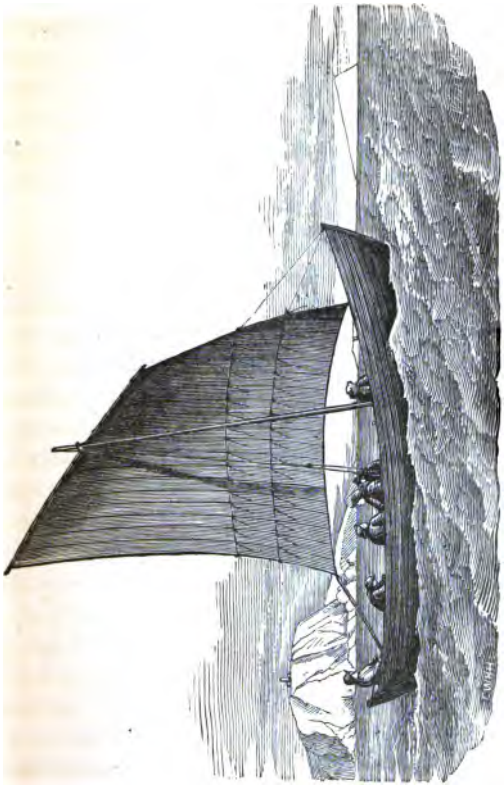
as before mentioned, work in the summer on the same grounds as the vessels belonging to Shetland, and they also land a great proportion of their fish at the Orkneys and Shetlands, where it is bought by the curers, so that the produce of these English vessels is included among the fish cured in Scotland.

Among the places occasionally visited by a few English and Shetland smacks in search of cod at the beginning of the season, is the very uncertain ground at Rockall. This bank lies in the Atlantic, about 300 miles west of the Outer Hebrides, and is marked by a single roughly conical rock about 30 feet high, with a smaller one, usually uncovered, at a distance of less than a hundred fathoms north of it. There is from twenty to fifty fathoms water within less than a mile around the rocks, and it gradually deepens on all sides beyond that distance. The fishery is only carried on within the fifty fathoms line, and must, therefore, be within a short distance of the rock. The very limited extent of ground on which the fish are found, the danger of keeping near the rock in bad weather, and the difficulty in finding it again when, as sometimes happens, the vessels are blown away, all combine to prevent regular fishing at Rockall; and there is further discouragement in the fact that, except quite at the early part of the season, the fishery is not likely to be successful, and even then there is a good deal of uncertainty about it. The Shetland long-line fishery for ling and tusk is worked in the home waters, and is very important. It is carried on from open boats called "haaf," or deep-sea boats, which have long been

famous for their seaworthy qualities. These are the true "Norway yawls," having very much the build and character of whale-boats, and they are handled in a wonderful manner by the Shetlanders, who show in their love for the sea, and by their daring and energy in their work on it, that they are still worthy of their descent from the Norsemen, of which they are all so proud. These skiffs are about 20 feet on the keel, 28 feet over all, and with 8 feet beam. They carry a single large lug.

The most important station on the west coast of Scotland is Stornoway, in the Outer Hebrides. This is the great centre of the herring fishery in the Minch, or the sea lying between the outer islands and the main coast of Scotland. The fisheries here are of the same kinds as those on the northern and eastern coasts; but that for herrings is of considerable importance, not only on account of its extent, but because it begins earlier than on the eastern side, and the fish cured at Stornoway are always the first in the Continental markets. The herring fishing on the Atlantic side of the Outer Hebrides is very uncertain at all times, but about April the fishery begins both at the north and south of these islands, and is carried on in the Minch till the middle of July about Stornoway, but generally comes to an end in June at the southern part of the channel. Curing is done at Stornoway, Uist, and Barra, especially at the first-mentioned station; but a considerable quantity of herrings is sent fresh, with only a sprinkling of salt over them, to Glasgow and Liverpool, special steamers being em-

ployed almost daily during the season for their transport. Most of the cured fish goes to the Continental



Shetland Yawl.

markets, especially to Russia. The curing is necessarily carried on under the inspection of the Fishery

Board, but the Government brand is entirely disregarded on the west coast, and the curers trust to their own names for selling the fish. They allege that the western fish are more delicate than the others, and will not bear the close packing requisite for ensuring the proper weight in each barrel if the brand is desired. The early market, however, is, without doubt, the great object sought; and the curers will not allow the number of days for the fish to be in pickle, before sending them away, that is insisted on if the brand is to be given.

The general season for long lining, by which the cod, ling, and tusk are here exclusively taken, is from November to July. Cod and ling—the latter being especially abundant—are caught on various parts of the coast, and have long been successfully fished; a bank off the Butt of Lewis, and another large one in the middle of the Minch, being favourite resorts for them. The tusk are chiefly found on the Atlantic side of the outer islands. Shore-curing is carried on here as at the Shetlands, and the beach, in suitable places, may be commonly seen covered with the drying fish during the season. Very little of it goes from here to the foreign market, but a good deal is sent to Ireland.

There has been a large fishery for lobsters for many years at Bernera, and East and West Tarbert for the English market, and large quantities of periwinkles are collected at the several islands known generally as the Hebrides, and are sent to the same destination.

I need say but little of the close time which was

established for herrings in 1860. The persons at whose instance the law was made, were not the fishermen, but some of the curers, who sought to raise the price of their fish caught during the regular season, by prohibiting the capture of herrings of any description at other times; although the fishermen on many of the poorer parts of the west coast were largely dependent on them as food, and, to a still more important extent, as bait for the line fishery. Thus, directly and indirectly, the fishermen suffered, until their sore distress became known, and the matter was inquired into. Instructions were then given not to enforce the law. In 1865 close-time was abolished on part of the coast, and shortened on the rest; and the Sea Fisheries Act, 1868, entirely did away with it on the whole of the west coast, except within the three-mile limit from the shore between Ardnamurchan Point and the Mull of Galloway. The original close-time Act only applied to the west coast; and happily there are great difficulties in enforcing that small portion of it which still remains on the Statute Book; for such local restrictions cannot be justified by anything that is known of the cause of either the abundance or scarcity of herrings in different years.

The fisheries I have now mentioned are worked, more or less, all along the west coast, in some places more attention being given to one kind than another. Among the islands near the mainland, herring-fishing is less successfully prosecuted than farther out, and the generally poor fishermen do their best to obtain a living mainly by line fishing and lobster-catching.

In the Firth of Clyde the fisheries are more varied, and of considerable importance. At Campbelton we once more meet with beam trawling; but it is only in shallow water near the shore, after the herring season; and flounders, with a few soles, are the principal fish thus caught. The same kind of fishing is worked near the mouth of the Clyde. There is also some fishing by hand lines and long lines; and set nets are used in some parts of the Firth for catching cod, hake, and other kinds of fish. Campbelton, the Kyles of Bute, and Lochfyne, were for many years the scene of an active struggle between two sets of fishermen, both of whom were engaged in catching herrings, but by very different methods. The usual mode of drifting for herrings, as followed in deep water all round our coasts, had long been the only recognized method in the localities I have mentioned, as it still is practically on other parts of the Scotch coast. But about the year 1838, the sean or circle net, known in Scotland as the "trawl," was introduced as likely to be as useful for catching herrings in Scotland, as it is for capturing pilchards, sprats, and mackerel in other places farther south. It is most effective when used near the shore; and when the fish are in convenient localities, a very large number may be enclosed at once, and a boatload or more of herrings obtained, after an hour or two of work in places where the water is not deep enough for drift nets to be employed. It might have been supposed that the drift fishers and the "trawlers" in Lochfyne would be able to work in their distinct localities without difficulty; but the

drift men could recognize only their own mode of fishing as the right one, and they brought charges against the "trawlers" of destroying young fish, frightening the shoals away, preventing the passage of the fish to the inner parts of the lochs, and finally they said that the herrings caught by the "trawl" were often so bruised and knocked about, that they were not fit to cure. The one important objection of the drift fishers to the system of "trawling" or seaning, was elicited in the course of subsequent Government inquiries into the dispute, and this was that the large catches of herrings sometimes made by the "trawl" lowered the market price of the drift fish. The curers also joined in the dispute, because the trawl fish were mostly sold in the fresh-market, and consequently cured fish were in less demand. In 1851, an Act was passed to put a stop to "trawling" for herrings on the coast of Scotland, and more stringent measures were brought to bear on the trawl fishermen in 1860 and 1861, so as to effectually suppress their operations. Serious disturbances and collisions had taken place between the two sets of fishermen, and a gunboat became necessary in Lochfyne to ensure the law being carried out. So strong a feeling existed, however, among a large body of the fishermen and others that the complaints against "trawling" were unjust, and the prohibition injurious to the interests of the public as well as to the fishermen immediately affected by it, that the subject was formally investigated by the Government, as previously mentioned; a special Royal Commission being appointed

for the purpose in 1862, and the Royal Sea Fisheries Commission also going into the question in 1864, in the course of their general inquiry into the state of all our sea fisheries. Both Commissions were most decided in condemning the prohibition of "trawling" for herrings; and it was shown by the comparison of several series of years, that the fluctuations in the Lochfyne herring fishery had been as great before trawling was introduced as at any subsequent period. By Acts of 1867 and 1868, trawling was again permitted, and continues at the present time.

The three important stations in Lochfyne are Inverary, four miles from its northern extremity, Ardrishaig, about eighteen miles south of it, and Tarbert, ten miles lower down, and six or seven miles from the entrance to the loch. The total length of Lochfyne is therefore nearly forty miles. Just above Ardrishaig the loch suddenly narrows, and is further contracted at this part by Otter Point, which projects westward for some distance across, and forms the lower boundary of what is called the Upper Loch. This is from one to two miles wide, and the lower loch varies from four to five in width. There is deep water through the entire length, although the depth is irregular, ranging from twenty fathoms in some parts, to as much as one hundred fathoms near the entrance. In some years the herrings go up the loch to its extremity, in others the fishing is almost confined to the neighbourhood of Tarbert. For the last few years the fish have not gone very far up, although good fisheries have been made near the mouth, both by "trawl" and drift net.

Almost every kind of explanation of the general scarcity of fish in the upper parts of the loch has been suggested, with very little evidence to support it; and since "trawling" has been again permitted, that system of fishing has been once more charged with keeping the herrings away. In 1874, three Scotch gentlemen of position, and who were likely to command the confidence of the fishermen, formed themselves into a private committee to inquire into the cause of the failure of the Lochfyne fishery: and in the following year they submitted a Report, with certain recommendations, to the Lord Advocate of Scotland. With reference to trawling keeping the fish out of the loch, a question to which the Committee appear to have given considerable attention, they say:—"The fact cannot be explained away, that the fish seem to be at present disinclined to enter other narrow waters where trawling is unknown." I need hardly say anything about the general result of their inquiry, as it has been shown that the Committee had not made themselves sufficiently acquainted with the entire subject for their recommendations to be of any practical value; but the fact mentioned by them, of the herrings seeming at present disinclined to enter other narrow lochs where there has been no "trawling," should have some effect in silencing the discontented drift-fishermen of Lochfyne.

On the coast south of the Firth of Clyde, good fishing for both cod and turbot is to be had on a large bank off Ballantrae, well known as a resort for herrings at the spawning time. The larger fish are probably

attracted to the locality by the herrings, and are caught by set-nets anchored at the bottom.

Long lining is also carried on from here, and this fishery is worked at eight or ten miles from the land. At Drumore remunerative employment has been found for the fishermen, in dredging the several valuable beds of oysters which have been discovered from time to time in the neighbourhood, and which attract a good many English and Scotch boats to the locality. Portpatrick has also come into notice in the last few years, from the attention there given to the long-line fishery for cod during the winter months. The fish are taken in deep water and among rapid tides, and are considered of finer quality than from any other station in the district. The railway to this port has no doubt had much to do with the development of this fishery. The only other fishing of any particular importance on this part of the Scotch coast is the beam trawling, which since 1870 has been carried on with considerable success on a stretch of twenty or twenty-five miles between Lochryan and Drumore. The trawling season lasts only through the months of February, March, and April, and successful fishing depends very much on the state of the weather. The trawl-smacks belong chiefly to Whitehaven and Liverpool, and their number has varied from fourteen to twenty-two in the season. Large hauls of fish have been taken, and turbot, holibut, brill, soles, plaice, flounders, cod and whiting, form the marketable produce of this fishery. It seems to be as characteristic of this part of the west coast of Scotland as it is of the corresponding

coast of England and Wales, that what are commonly understood as trawl fish, are only found on certain grounds during a short period of the year. This will probably prevent the Scotch fishermen giving much attention to this method of fishing—one which requires considerable outlay and skill for its successful working, and against which there has been, and still is, a decided prejudice amongst them, although as a class the Scotch fishermen are conspicuous for their industry and enterprise.

I am glad to be able to add, that every year shows a marked improvement in their habits of sobriety generally around the coast; and whatever tendency there may have been to indulge whilst on shore, it has not interfered with hard work at sea, or profitable attention to the regular fisheries, when the seasons for them have come round.

In 1867, the total value of fishing boats, nets and lines in Scotland was estimated at 947,109*l.* In 1875 it had increased to 1,092,275*l.*

MANX FISHERIES.

Up to 1868, when the Sea Fisheries Act was passed, the fisheries of the Isle of Man came under the notice of the Fishery Board of Scotland, and the annual statistics published by the Board included some account of what had been done by the Manxmen. This has come to an end, and the only official information now given to the public about the fisheries of the island, is that relating to the number of boats and men engaged in them.

The most important fishery on that coast is for herrings, and Castletown, Port St. Mary, Port Erin and Peel are the stations immediately connected with it. It is carried on entirely with drift nets, and usually commences early in June. The fish are at first mostly taken at a little north of Peel, on the western side of the island, and thence southwards to the Calf of Man as the season advances. It is continued along this part of the coast and a little south of the Calf until the end of September, when the fish are believed to spawn on the rough ground in that neighbourhood. The great herring fishery is therefore confined to the southern half of the western side of the island. In October, however, herrings are found in Douglas Bay, where there is good reason to believe they spawn.

These fish are described as being of a different class from those caught off the Calf, and are supposed by the fishermen to come from the north-east. As soon as the drift season has come to an end at the Isle of Man, the Manx boats proceed to the Irish coast, and take part in the herring fishery there in November and December.

There is very little curing done in the island, almost all the herrings caught on that coast being sent with just a sprinkling of salt over them to Liverpool, or some port in Wales. A few trawlers work off Douglas, and some mackerel are taken by line and sean in Douglas Bay; but the Manxmen regularly visit the south of Ireland during the mackerel season there, and by steady attention to the fishery, generally manage to earn a good deal of money. When not engaged with either the herrings or mackerel, the fishermen occupy themselves with the long lines, and catch a large number of cod, either near the land or far out at sea, according to the season.

The Manx boats for deep-sea work are fine craft, from 40 to 50 feet in length, half-decked, but can be entirely covered in when necessary. They are dandy-rigged, and sail well.

IRISH FISHERIES.

The history of the Irish Sea Fisheries for the last thirty years offers a painful contrast to what we know of the English and Scotch fisheries within the same period; for it is a record of almost continuous decline in the number of native fishing boats, and of the men and boys who have any claim to be counted as fishermen—little as that is in the majority of cases. And yet this decline is due to no scarcity of fish on what have long been recognized as the most productive parts of the Irish coast—the eastern side of the island, where the herring fishery is regular and important; and the southern coast, where mackerel abound in their proper season. We learn from the Reports of the Inspectors of Irish Fisheries something of what is done there, and who are the persons who carry on the work and obtain the reward. In 1875, the highest number of fishing boats working in one day from Howth, the most important herring fishing station, was 683. Of these there were 219 Cornish, 197 Irish, 142 Scotch, and 125 Manx boats. The Irish boats were then only 29 per cent. of the total number at work in purely Irish waters. At Ardglass, the only other station of importance, and in a more northerly situation, the largest average number in any one week of the fishery was 287. These

comprised 20 Cornish, 40 Irish, 52 Manx, and 175 Scotch boats. At this station the Irish boats formed only 14 per cent. of those engaged in the fishery. In the Kinsale mackerel fishery also, the Irish boats are only a small proportion of the total number of craft which come from various parts to share in the spoil.

I take the following statistics from the last Report of the Inspectors, to show how great has been the decline in the number of Irish sea-fishing boats and fishermen.

Number of Fishing Boats and Fishermen employed in the Coast Fisheries from 1846 to 1875, inclusive:

Year.	Boats.	Fishermen.	Year.	Boats.	Fishermen.
1846	19,883	113,073	1861	11,845	48,624
1848	19,652	81,717	1862	11,590	50,220
1849	18,100	71,505	1863	11,375	48,601
1850	15,247	68,380	1864	9,300	40,946
1851	14,756	64,612	1865	9,455	40,802
1852	11,789	58,863	1866	9,444	40,663
1853	12,381	49,208	1867	9,332	38,444
1854	11,079	49,227	1868	9,184	39,339
1855	11,251	47,854	1870	9,099	38,650
1856	11,069	48,774	1871		
1857	12,758	53,673	1872	7,914	31,311
1858	11,823	52,101	1873	7,181	29,307
1859	11,881	50,115	1874	7,246	26,924
1860	13,483	55,630	1875	5,919	23,108

No returns are given for the years 1847 and 1869, but those for the other years are approximately correct. There is great difficulty, however, in procuring exact particulars, although the present Inspectors take especial pains in their instructions to the Coastguard to secure as much accuracy as possible.

The boats with their crews are divided by them into three classes independently of tonnage, and this plan enables us in some measure to understand who are included under the head of Fishermen.

In 1875, the number of craft solely engaged in fishing was 1341, and crews 6241; mostly engaged in fishing—boats 602, crews 1870; only partially engaged in fishing—boats 3976, crews 14,997; total boats 5919, total crews 23,108. To persons who are not familiar with the habits of many of the coast population in Ireland, it will probably cause some surprise to hear, on the authority of the Inspectors, that the boats and men in the third division, or those only partially engaged in fishing, are not employed in that occupation on an average for more than one month in the year. The boats in this division form two-thirds, and the men nearly that proportion, of the total number of sea-fishing boats and fishermen in Ireland.

The duty of collecting the information relating to the number of Irish boats and fishermen devolves on the Coastguard; but there are extensive lines of coast in some of the wilder and less populated districts, which are not often visited by these officers; and under these circumstances, it is often impossible to depend on the accuracy of the returns of either boats or men. The returns furnished also by the Customs are in some cases obviously incorrect, and I cannot attempt to explain how, in 1875, they give 367 more boats, and 3739 more fishermen than appear in the undoubtedly more carefully prepared returns furnished by the Inspectors. As the statistics of fishing boats, published

annually by the Board of Trade, are solely derived from information supplied by the Customs all round the coast of the United Kingdom, there is reason to believe that not much dependence can be placed on the general system of registration now adopted under the Sea Fisheries Act, 1868. It is almost impossible to obtain accuracy in many parts of Ireland and Scotland, and it is very doubtful whether even the English returns are entirely trustworthy.

The Irish fisheries have been subject to fluctuations at various times, so far as the number of boats and men engaged in them is concerned; but the great decline in comparatively recent years dates from the period of the famine; and those who have had a long acquaintance with the condition of the west coast fishermen, believe their present depressed state is entirely the result of that disastrous time. But it may be asked, if there has been no recovery after thirty years, but, on the contrary, an almost continuous decline in the number of fishermen up to the last year, what hopes are there of ever seeing the fishing population again in a thriving condition? Poverty is but an imperfect excuse for the present state of things. Local assistance has been given time after time with only a temporary improvement. Emigration to America and elsewhere has attracted thousands from their native shores; and it can hardly be a matter of regret, for most of those who went away have worked with an industry in other countries, of which there was little appearance when they were at home. The great decline in the fisheries is no doubt mainly due to the great tide of

emigration which has long been setting westward. But the majority of those who left the west coast, and of those who still remain there, had never much claim to the title of fishermen, for they belonged to the class who only fish occasionally, when seaweed-cutting, farming, and other occupations fail them.

On the east coast there is a more pleasing picture. The example set by Cornish, Scotch, and Manx fishermen appears to be having some effect on those in that part of Ireland. Boats are improving, the men are more industrious than formerly, and their numbers are increasing there to some extent; but there is still great room for improvement, and there must assuredly be sufficient inducement for them to work at the fisheries, when it pays hundreds of fishermen from other parts to come long distances for the sake of the profits to be made in the Irish Channel. It is too early yet to judge of the working of the Irish Reproductive Loan Fund recently established under a Parliamentary grant, for the purpose of assisting needy fishermen with loans to be expended on fishing gear; but as might have been expected, the money applied for has been far in excess of what can be provided. About 8000*l.* was available, and the total amount asked for exceeded 40,000*l.* The Inspectors express some surprise that the applications were not for a considerably larger sum. There is much difference of opinion as to the probability of these loans doing any real good to the fishermen; but as the experiment is now being fairly tried, we must wait and hope for a satisfactory result. I should have been glad, how-

ever, if the Irish people generally had shown some disposition to help their own fishermen in the manner now being done by Parliament, but they have only clamoured for Government assistance.

The following paragraph appears in the Inspectors' Report for 1874:

"We regret that the generous offer made by Mr. Benjamin Whitworth, member for Kilkenny, to contribute 2500*l.* for the benefit of the fishermen, provided 7500*l.* was subscribed by the rest of Ireland, so as to raise a fund of 10,000*l.*, has not met with a single response, so that his intended liberality remains unavailed of."

I will now give a short sketch of such of the Irish fisheries as appear to deserve notice. The most important ones are on the eastern and southern coasts, and we may commence with those from Dublin Bay. Dublin is the head-quarters of the deep-sea trawlers, and possesses a fleet of about fifty smacks, ranging from 30 to 50 tons, N.M., and usually working from that station. Deep-sea trawlers were first used from Dublin in 1818, some Brixham smacks having been bought for that purpose. Brixham men also came over, and in the course of time more vessels were added to the fleet, as the fishing grounds became better known, and the profitable character of the fishing was established. The trawlers work all the year round when they can get hands, but in the summer months, the generally light weather is not favourable for trawling, and the men find more profitable occupation in the herring fishery and on board the numerous yachts,

where their services are in great request. Although trawling has been carried on for many years along this part of the coast, the grounds which have been, and continue to be, systematically worked by the Dublin smacks are not very extensive. They lie for the most part within a triangular space between Dublin and Dundrum bays and the Isle of Man. The fishing grounds consist of an irregular series of patches differing in shape and extent, and these are worked more or less successfully according to the season; the inner grounds—the neighbourhood of the Kish Bank, Skerries Bay, and the Mountain Foot ground—being fished during the colder months. The Isle of Man ground, abounding in soles, and lying in deep water, is usually worked from March to July. In January many of the smacks go to the coast of Waterford and fish on what is called the Saltee ground, a very productive patch about south-west from the Saltee light-ship. There are bye-laws in force on parts of the coast prohibiting trawling in certain bays, but these regulations appear to have been made more with the idea of satisfying the complaints of the line fishermen, than from any belief that the trawlers did any harm.

Line fishing is general along the eastern coast, and long-lining is largely carried on in Dublin Bay and northwards. The fishermen at Rush have devoted themselves principally to that kind of work, by which they catch cod, ling, haddock, and conger, not only in their own neighbourhood, but also during their occasional visits to the western and southern parts of the island. The disappearance of the haddock from

the vicinity of Dublin Bay a few years ago caused a great outcry against the trawlers, to whose operations it was attributed; but the recent return of this fish to its old grounds, notwithstanding the fact that trawlers had increased in the interval, has tended to the removal of this misapprehension. As the spawn of the haddock is not deposited on the ground, but has been proved to float during the development of the young fish, it is difficult to understand how trawling could interfere with the supply of these fish except by catching them, and that is simply what the line fishermen themselves want to do. On the coast of Scotland there have been the same fluctuations in the numbers of haddocks, and they will undoubtedly again occur.

The most important and profitable fishing to the general body of fishermen on this part of the coast is that for herrings, and it attracts, as I have previously mentioned, a large number of boats from Cornwall, Scotland, and the Isle of Man. The two great stations for this fishery are Howth, at the northern point of Dublin Bay, and Ardglass, a little south of Strangford, and opposite the Isle of Man. The season commences at some time in June, but the boats are not in full work till July. From that time till the end of September, or sometimes far into October, drift fishing is followed up in some part of the Irish Sea, the boats gradually decreasing as the season advances, and many of the Cornish boats leaving in August, so as to take part in the pilchard-fishing on their own coast.

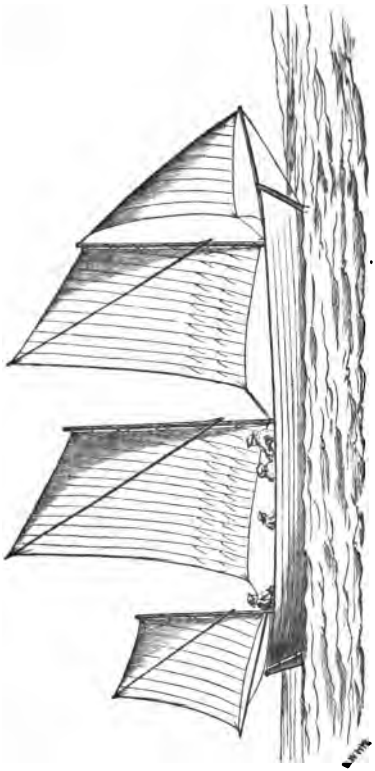
A little curing is done at Howth, but a large proportion of the herrings caught on the east coast is shipped

fresh by steamers to English and Scotch ports. The same may be said of the produce of the other Irish fisheries—line, drift, and trawl fish; for a better market can be obtained on the English side of the Irish Channel, than at Dublin and the inland towns.

South of Dublin, the oyster fishery near Arklow employs a large number of men and boats. The banks are in 10 or 12 fathoms water, and extend southwards almost to Wexford. It is said that if the fishermen had larger boats, much more might be done than at present in the line fishing, and in working oyster beds at a greater distance from land. A harbour, accessible at all times of tide, is also much needed on this part of the coast. The herring fishery at Wexford is usually late in the year, but it is only on a small scale. The boats, or "cots," there used for the drift fishing are of a peculiar build, and deserve a short notice. They are sharp at both ends, and are entirely flat-bottomed with the exception of a small bit of keel at the bow and stern, and a false keel or bilge piece extending some distance on each side, between the floor and the planking. They are about 30 feet over all, and with 7 or 8 feet beam. A centre-board with a depth of 5 feet below the floor is lowered, when the boat is on a wind; and the sails consist of three sprit-sails and a jib. These boats are well suited for working their way over the shoals inside and outside Wexford Harbour.

On the south coast we find a station of some little importance at Waterford Harbour. There is a considerable extent of fishing ground within the harbour itself, and good trawling is to be had outside on the

Saltee ground, and farther out, on the Nymph Bank. The latter has been for many years famous for the



Wexford Herring Cot.

variety and abundance of its fish, but its distance from the land, 30 or 40 miles, has interfered with systematic fishing on it, so much time being lost in going to

and returning from the ground. The Hull system of packing the fish in ice as soon as caught, seems peculiarly suited to this case; and at one time a steamer was purchased to be used as a carrier; but unfortunately she was at first employed in trawling in the open part of Waterford Harbour, and this was more than the small-boat fishermen could put up with. It was at a time when the native feeling was very strong against the large trawlers, and the appearance of a steam trawler gave rise to opposition of such a violent character, that it became necessary to send her away. Dunmore, on the west side of the entrance to the harbour, is the trawling station; and this kind of fishing in deep water continues to be successfully carried on. A curious bye-law is in force in Waterford Harbour, by which trawlers exceeding 10 tons are excluded from certain parts of it. A short time ago the limit was 5 tons, but it has been recently enlarged. The effect of this bye-law is, that only those boats which can work in shoal water, where the young fish most abound, are allowed to do so; the privilege of destroying the small fry is limited to those who can do it most effectually! The professed object of this regulation was to prevent the large trawlers from catching the young fish; its real object was to quiet the turbulent spirit of the small fishermen by keeping the large trawlers out of their way. There is a good deal of line fishing here also, and seans are used for mackerel and sprats when the fish come within reach.

Between Waterford and Kinsale, various modes of fishing are practised, but none requiring any special

notice. Dungarvan was once an important place, but its fisheries are now much reduced, and numbers of the fishermen have emigrated. Trammels are used at Ring for catching hake, and there is a little inshore trawling and hand-lining.

In Ballycottin Bay and Cork Harbour and its neighbourhood, the fisheries are also varied, but not very extensive, although a good many fish are taken at times.

Kinsale was at one time famous for its line fishery, and the Kinsale hookers were celebrated as sea-going fishing boats. The town has in recent years come into notice as a great station for the mackerel fishery, and at this time is the resort of boats from other parts of Ireland, as well as from Scotland, Cornwall, and the Isle of Man. The fishing, which is by drift nets, begins early in March, and is carried on till about the end of June; and, as is the case with the herring fishery on the east coast, the stranger boats capture the larger proportion of the fish. Of late years many French boats have taken part in this fishery, but their captures are cured on board and taken away. A great step has been made during the last few years in the development of the mackerel fishery, by the establishment of a line of steamers, in addition to the sailing vessels, for the transport to England through Milford of the fish landed at Kinsale. In 1875 there were seven steamers constantly engaged in this work, and occasionally three additional ones, besides nineteen sloops. Several other vessels were employed as hulks for holding the ice, boxes, &c., for packing; and the

quantity of ice imported for the purpose of packing the fish in was 3157 tons. The mackerel are placed with layers of broken ice in boxes holding a "hundred" of fish each, which, in the case of mackerel, is equal to six score, or 120. I find from the Inspectors' Returns, that in 1875 there were 121,533 boxes of fish sold at Kinsale as the produce of the fishery for that year; the prices per "hundred" ranging from 3*l.* 10*s.* at the beginning of the fishery to 1*s.* 2½*d.* at the close; the total amount realized by the various fishermen who landed their fish at Kinsale being 73,523*l.* Pilchards are abundant every year along the south coast of Ireland; but notwithstanding the exertions made by the Inspectors and others to establish a fishery for them, little has been done by the fishermen to second their good intentions, and I fear it will be long before advantage is taken of the profitable opportunities year after year thrown in their way.

Bantry and Dingle bays are both good fishing grounds, and much profitable work has been done in the last-mentioned locality. Trawling and line fishing have been especially successful there. At Dingle particularly, and on part of the coast northwards, a remarkable kind of fishing boat is in common use. This is the "Curragh," or canvas canoe. The construction of these curraghs is very simple, consisting of a light wooden frame for the top sides, strengthened by a keelson curved slightly upwards at each end to form the stern and sternpost. The ribs are pieces of cask hoop, cut to such a length as to give the requisite curve to the bottom, and outside these are nailed long

narrow battens to serve as flooring. Over this skeleton pieces of tarred canvas are nailed, each strip about two feet wide, and extending round the bottom from one gunwale to the other. Thwarts are fixed in the usual manner, and the canoe is propelled by three or four pairs of light oars. These curraghs float like bubbles on the water when empty, but with four men in them, and each using a pair of oars, they are easily managed, and will go through a great deal of bad weather. They are about 20 feet long and 4 feet wide, and are used for the line fishing.

On the west coast of Ireland we come among a class of men, a large proportion of whom are in a state of extreme poverty, and whose lives are spent in various occupations, such as farming, seaweed cutting, &c., besides the occasional one of fishing. In very many cases, when the fish appear on the coast, these men have few means of catching them, and when fortune favours the fishermen, there is frequently no way of disposing of their catch to advantage. It seems almost hopeless to expect much development of the fisheries on this coast, although at times fish are abundant there. It is from this part that emigration has done so much to thin the population; but now that the American labour market has been over supplied, and many of the Irish are returning to their homes, it is difficult to say what will be the effect on those who have had little heart or inclination for anything but to follow their friends abroad.

Galway has been conspicuous for many years for the greater success of its fisheries. The lawless habits of

the Claddagh men—the fishing community of Galway —have done much, however, to curtail the work that might have been done in the bay; but the trawlers appear at last to have obtained a footing there, and there can be no doubt that the fisheries might be much improved, if peaceful work could be ensured. The herring fishery is that which brings most general profit, for the time it lasts, but the line fishery for cod, ling, and whiting is of old standing, and the Galway hookers have long been famous among Irish fishing boats. On the coast northwards from Galway, line, drift, and sean fishing are carried on more or less, but the fisheries are very uncertain, and there has been a complete scourge of dogfish in Donegal Bay and on parts of the west coast during the last year or two, which has almost ruined the hopes of the fishermen.

There is little to be said of the north and north-east coasts; line fishing is perhaps most general, and there is some small trawling in the loughs, but the fisheries are unimportant till we come to those that I have already noticed on the east coast of the island.

SALMON FISHERIES.

By ARCHIBALD YOUNG, Esq., Advocate, Commissioner of Scotch Salmon Fisheries, and late Special Commissioner to Inquire into the Effects of recent Legislation on the Salmon Fisheries in Scotland, and into the operation of the Tweed Fisheries' Acts.

THE Salmon may justly be termed the king of British fishes. When in fine condition, he is conspicuous for his shining silvery mail, his compact, graceful form, his strength, swiftness, and agility, which bear him forward and onward through impetuous torrents and foaming cataracts, up to the very sources of our mountain streams. His admirable edible qualities render him a favourite at every table; the exciting sport he affords, endears him to the angler; while his strange dual existence in the fresh and salt water and the remarkable circumstances attending the transformation of the parr into the smolt, the smolt into the grilse, and the grilse into the perfect salmon, afford matter for curious and interesting speculation to the student of natural history.

In the following brief treatise, of which this noble fish is the subject, I propose to consider, 1st, The Natural History of the Salmon; 2nd, Salmon Fishery, Law and Legislation; 3rd, Natural and Artificial Obstructions to the Ascent of Salmon to their spawning grounds; 4th, Pollutions; and 5th, The Statistics of the Salmon Rivers of the United Kingdom.

Natural History of the Salmon.

The natural history of the salmon is a subject of much interest and of considerable difficulty. It has given employment to many careful and accurate observers, and has occupied the pens of many accomplished writers. The mode in which salmon reproduce their species; the length of time occupied in hatching the ova; the period at which the parr assumes the silvery dress of the smolt and prepares for his descent to the sea; the identity in species of the parr with the grilse, and of the grilse with the salmon; the food and growth of salmon in the sea; whether salmon always return to the river where they were bred; these and other problems of salmon life have repeatedly been the subjects of controversy, and still afford ample materials for observation and discussion. One result of this has been that, although we may have yet much to learn, we probably know more about the habits of the salmon, than about the habits of any other fish that frequents the rivers and seas of the British islands.

In the latter end of autumn, and in the earlier months of winter, salmon ascend to the gravelly streams in the upper reaches of our rivers, for the purpose of spawning. The female fish selects a spot on some gravelly ford for her nursery, and then proceeds to excavate one, two, or more furrows or trenches in which she deposits her ova; and over the deposit thus made, the male salmon comes and sheds his fertilizing milt, at the same time spreading the gravel over it by the action of his tail and fins. It has been calculated, that

each female salmon contains about 900 ova for every pound of her weight; but the ova, after being deposited in the gravelly bed of the stream, and the young fry when hatched, are exposed to many dangers from floods and from the attacks of pike, trout, sea-gulls, herons, and other enemies, so that Mr. Ashworth tells us that, in 1852, Mr. Buist and he, from the best information they then possessed, arrived at the conclusion that not one egg out of 1000 ever became a marketable fish, and that in 1861, Mr. Ffennell and he formed the opinion that scarcely one in 3000 ever survived. This terrible destruction of ova deposited and fry hatched in a river, is a strong argument in favour of artificial hatching, which has been so successfully carried on of late years at Stormontfield, South Kensington, Arcachon, Huningue, and several other places; because, while 3000 eggs deposited in the river-bed in the natural way will only yield one marketable fish, the pisciculturist from the same number of eggs will send down at least 1000 smolts to the sea. At South Kensington, the breeding boxes are slate troughs, rising one above the other in a stair-like form, with pipes supplying pure water passing through them. The troughs are about 3 feet 2 inches long, 7 inches wide, and about 7 inches in depth. They are six in number, rising in tiers, and the cost of the whole is five pounds. These troughs are half filled with gravel, cleansed by heat from the larvæ of insects, and on this gravel so prepared, the ova are deposited and the water turned on. This simple mode is found to succeed admirably well, as fully two-thirds of the eggs deposited are safely hatched.

Parrs and Smolts.

The usual period of hatching in our northern rivers is from 90 to 130 days, according to the mildness or severity of the weather. The higher the temperature of the water, the more rapid the process of hatching; though there is a limit to this, as it has been shown that in a temperature exceeding 70°, the eggs will not come to life.

I cannot here give an account of the experiments by which it has been conclusively proved that the parr is the young of the salmon. These will be found detailed by a variety of writers; and the fact is now generally accepted as fully established. But there is still some diversity of opinion respecting the period when the parr becomes a smolt, and descends to the sea in fulfilment of his migratory destiny to spend his life between river and sea—to breed in the former, and to feed and grow in the latter. Do the parrs become smolts between thirteen and fifteen months after they have left the egg, or at the age of two years and two months? Mr. Couch (History of the Fishes of the British Isles) says that some of the young of the salmon produced by artificial impregnation are "ready to pass out of the fresh water early in the first year of their existence, while others of them, and it would appear almost entirely, if not altogether exclusively, the males, are not ready for this emigration before the second or even the third year of their age." Mr. Russell, in 'The Salmon,' says: "The results to which the evidence in the Stormontfield ponds seems to lead, in the question as to

the period at which the young of the salmon makes its first migration, are chiefly these: one half of the young fish emigrate after the end of the first, the other half after the end of the second year; and *cæteris paribus*, the two-year olds go off a week or two earlier in spring than one-year olds." Mr. Buckland is of opinion ('Familiar History of British Fishes,' p. 321) that the young salmon descend to the sea as smolts in the months of May and June; some of them going the first year, some the second, and some the third. Quite recently, Mr. Dunbar, the lessee of the well-known Thurso river, in the county of Caithness, who is a great salmon-breeder, hatching out about 500,000 annually in Caithness and Sutherlandshire, stated to me that the result of his experience was, that about 8 per cent. of the salmon he hatched became smolts at the end of the first year, about 60 per cent. at the end of the second year, and the remainder, or about 32 per cent., at the end of the third year. It is a curious fact, that the silver mail which marks the transition of the parr into the smolt, when it is led by an irresistible instinct to descend as rapidly as possible from the fresh to the salt water, forms a sort of armour and protection against the effects of the new element in which he finds himself. The smolt lives, thrives, and grows with marvellous rapidity in the salt water; whereas the parr, though apparently quite as hardy a fish, speedily dies. This was proved by Mr. Brown, of Perth, who placed some parrs at once in sea-water, where they at first became restless as if suffering pain, changed their colour, languished and died.

Effects of Artificial Breeding on the Tay.

The late Mr. Robert Buist, the first superintendent of the Stormontfield breeding ponds on the Tay, near Perth, writes as follows in 1866, with regard to the advantages of artificial breeding in improving the stock of a salmon river: "The works at Stormontfield are at length placed in a position whereby fair scope will be given to our operations, and the fruit of our attempt to improve the fishings be more clearly seen. After the expenses of the new work are defrayed, the annual outlay will not be higher than it was before, and the matter of from 70*l.* to 100*l.* will be sufficient for carrying out all the purposes required. Finally, from the experience of upwards of fifty-five years on the Tay, and several years on other rivers, I would strongly recommend to all proprietors of salmon fisheries, to follow the example now set by the Tay proprietors in regard to pisciculture, the outlay being trivial, and the benefits that may ultimately accrue being very great." In proof of the correctness of these views, Mr. Buist furnishes us with the following table of the increase of the rental of the Tay since 1853, when the fishing season was shortened, and the Stormontfield breeding ponds commenced.

	£	s.	d.		£	s.	d.
1854	9,269	6	5	1860	13,827	10	7
1855	9,977	13	5	1861	14,109	15	7
1856	10,199	10	4	1862	14,080	12	0
1857	10,772	0	5	1863	14,232	16	6
1858	11,487	2	5	1864	16,742	5	2
1859	12,884	14	0	1865	17,618	0	7

The annual rental of the Tay is now upwards of 20,000*l.*, and its produce of salmon, grilse and trout cannot be under, and is probably considerably over, 100,000 fish a year.

Growth of Salmon in the Sea.

Nothing is more remarkable in the natural history of the salmon than its wonderfully rapid growth and development in the sea. The tiny smolts that have taken one, two, or even three years to grow the length of a man's finger, go down to the sea and return to the river in six or eight weeks as grilse of from three to five pounds weight, or even of eight or nine pounds, after a somewhat longer sojourn in the salt water. The grilse is generally believed to spawn after its return to the fresh water, after which it again descends to the sea, where it assumes the characteristics of the mature salmon, and goes on gradually increasing in size at each of its annual migrations to the sea. In 1859 the late Duke of Athol caught three salmon on their way to the sea, weighing 10 lbs., 11½ lbs., and 12½ lbs. These fish were marked by a copper wire round their tails, and were again captured six months afterwards, on their return to the fresh water, when they were found to weigh 17 lbs., 18 lbs., and 19 lbs. respectively. The experiment of not allowing smolts to descend to the sea, but keeping them for several years in fresh water, has been tried with the result of proving that the laws of nature cannot be violated with impunity, as the smolts so kept were lean, stunted, and unfit for food.

One of the Stormontfield smolts which had been kept for four years in a fresh-water pond, was but 14½ inches in length, and weighed only 15 ounces, while the head was large enough for a 3-lb. fish.

Do Salmon return to the River in which they were Bred?

It is a generally received opinion that a wonderful and unerring instinct leads the salmon, after his descent to the sea, to return to the river in which he was bred; and at Bonar Bridge, in Scotland, where the united waters of four salmon rivers fall into the sea, the fishermen assert that the salmon bred in the Oykell, Cassly, Carron, and Shin, uniformly find their way back into their parent stream, and never wander into any of the adjacent rivers. Mr. Buckland thinks that the organs of smell, which are very strongly developed in the salmon, have something to do with this. "When the salmon," he says, "is coming in from the sea he smells about till he scents the water of his own river. This guides him in the right direction, and he has only to follow up the scent, in other words to 'follow his nose,' to get up into fresh water, i. e. if he is in a travelling humour. Thus a salmon coming up from the sea into the Bristol Channel would get a smell of water meeting him; 'I am a Wye salmon,' he would say to himself. 'This is not the Wye water: it's the wrong tap, it's the Usk. I must go a few miles farther on,' and he gets up steam again." Mr. Yarrell, however, thinks that salmon do not *always* ascend the

river in which they have been bred in order to spawn. That they rove for miles along the shores is proved by the great numbers that are captured by the stake and bag-nets on the Scotch coasts. Tweed salmon have been caught opposite Hopetoun House, on the Firth of Forth. It is, therefore, not improbable that if salmon have wandered far from their native stream, they may ascend at the breeding season another river, provided its temperature and conditions are congenial.

Size and Weight of Salmon.

Salmon attain to a great size and weight. As a rule the largest fish are found in the largest rivers; though very heavy fish are got in comparatively small rivers, as in the North Esk, near Montrose, the Roy, a tributary of the Spean, and the Stinchar, in Ayrshire. Mr. Yarrell mentions one of 83 lbs. as having come into the possession of Mr. Groves, of Bond Street; and Mr. Buckland gives the following catalogue of the largest salmon in his museum:

	Weight.	Length.
	lbs.	ft. in.
1. Tay salmon	70	4 3
2. Rhine ditto	69	4 8
3. Shannon ditto	54	..
4. Tay ditto, Kinfauns ..	53	4 0
5. Rhine ditto	51½	4 3
6. Tay ditto	51	4 3
7. Wye ditto	50	4 2
8. Shannon ditto	46	4 3
9. Wye ditto	44½	3 10½
10. Tay ditto, Kinfauns ..	42	3 8

Probably the largest salmon ever caught by the rod was one caught by a predecessor of the present Earl of Home, in the Tweed, which weighed 69¾ lbs. In 1812, a salmon of 67 lbs. was captured with the rod on the Barjarg water, on the Nith, by an old poacher of the name of Jock Wallace, who was celebrated as never having done a hand's turn of work in his life, except cutting his own firewood, which he generally did in other people's plantations. The salmon was hooked about 8 in the morning, in a pool called "The Clog," and was gaffed in the "Boat Pool of Barjarg" by some men coming home from their work at 6 in the evening. It was then found that only two hairs of Wallace's casting line remained. The salmon was taken to Barjarg Tower and weighed immediately afterwards in presence of the proprietor, Mr. Hunter Arundell, who, along with some other persons who were present, signed a certificate of its weight, a copy of which is now in the possession of his son, the present proprietor of Barjarg. In 1870, a salmon of 61 lbs. was caught with the rod in the Stanley water, on the Tay; and last November, Sir George Houston Boswell, of Blackadder House, landed a salmon of 53 lbs. from Mertoun Upper water on the Tweed.

Early and Late Salmon Rivers.

Attempts have been made, and are still making, in certain quarters in Scotland, to change late into early rivers—that is, into rivers which clean fish ascend early in the spring—by stocking them with salmon

bred from ova taken from early rivers. It is thought, however, that all such attempts must result in failure, and are simply a throwing away of money. The physical characteristics of the river proposed to be altered —such as its temperature, channel, height of source above sea-level, &c., remain unchanged; whereas the habits of the fish are, to a certain extent, mutable and susceptible of modification by the physical influences to which they may be subjected. The stocking, therefore, of late rivers with salmon hatched from ova taken from early ones will result, not in transforming the late rivers into early ones, but in changing the fish taken from the early river and transferred to the late one into late fish, or fish which will ascend about May or June instead of in spring. The river will modify the habits of the fish; but the fish will never change the characteristics of the river. Mr. Buckland and Mr. Walpole—whose experience entitles their opinion on such a matter to the greatest respect—quite agree with me on this point. "It was supposed," says Mr. Buckland, speaking of the English salmon rivers, "when the Salmon Act of 1861 was first made law, that it would be possible to convert a late river into an early river. When I first took office, I found, after due investigation, that this was a mistake, and my friend and colleague, S. Walpole, Esq., and myself, have worked out the subject in all its details, and we have now proved that it is impossible to convert a late into an early river. The supporters of the old doctrine have, one by one, vanished into space, but, like the man who invented the bellows, neither

Mr. Walpole nor myself have ever got much credit for our discovery."

It is by no means an easy problem to determine what is the true cause, or what are the true causes of earliness, or lateness, in salmon rivers. It has been stated on high authority that rivers which have a lake at the head are invariably early. This, however, seems by no means a satisfactory solution of the problem. Only a very few of the salmon rivers in England flow out of lakes; but at least two of these, the Derwent and the Leven—the latter of which runs out of Lake Windermere—are decidedly late rivers; and, when we come to look at the Scotch rivers, we find the lake-at-the-head theory contradicted by so many instances to the contrary, that we are at once compelled to reject it as affording anything approaching to an invariable law of nature. Upwards of fifty of the salmon rivers of Scotland, or one-half of the number comprehended under the general Salmon Fishery Acts of 1862 and 1868, either run out of or through lakes; and, of the numerous and productive salmon rivers of Sutherlandshire, there are not half-a-dozen that do not either rise from or flow through lochs, while the majority of the salmon rivers in Ross-shire, Inverness-shire, and Argyleshire, have their sources in or traverse considerable sheets of water. Yet the whole of the rivers on the western shores of these counties, without an exception, are late rivers. Then the Grimersta river, which rises in Loch Langevat, the largest lake in the extensive island of the Lews, and flows through a chain of lakes into the head of Loch Roag, is a very

late river, and so is the neighbouring Blackwater, which also runs out of and through lakes, as also the Cree and Laxay, two capital salmon rivers in the same island, which rise in Loch Cree and Loch Laxay. It is true that some support is to be found among the Scotch salmon rivers for the lake-at-the-head theory. The Tay from Loch Tay, the Thurso from Loch More, the Naver from Loch Naver, the Ness from Loch Ness, the Helmsdale from the Baden Loch, and the Brora from Loch Brora, are all early rivers. But it is clear that to deduce, as a general rule, from this plausible but imperfect collection of facts, that all the Scotch streams that flow out of considerable lakes are early, would be an entirely erroneous conclusion, when we consider, on the other hand, that the Shiel from Loch Shiel, the Laxford from Loch Laxford, the Ewe from Loch Maree, the Gruinard from Loch na Shallag, the Hope from Loch Hope, the Kirkaig from Loch Fewin, the Inver from Loch Assynt, the Carron from Loch Doule, and the Kirkcudbrightshire Dee from Loch Dee, are all late rivers.

A novel and ingenious theory to account for the lateness or earliness of salmon rivers was recently propounded by Mr. Buckland in his Report on the salmon rivers of England and Wales for 1875: "When considering," he says, "the salmon rivers of England and Wales as a whole, I determined, if possible, to find some general law as to why some of them are naturally early, while others, on the contrary, are naturally late. I, therefore, mapped out on an Ordnance map the catchment basins of all our best salmon

rivers, and I fancy that, by the continuous study of the matter, I have arrived at something like Nature's definite law of this important matter. The rule seems to be, with few exceptions: 1st, that the earliness or lateness of a river depends upon its proportion of mileage in length to its square mileage of catchment basin; 2nd, that if a river has a long course and small catchment basin, it will be late; 3rd, if a river has a short course and a large catchment basin it will be, undoubtedly, early. Rivers with less than 5 miles square of catchment basin to 1 mile of river are very late. Rivers with less than 7 miles to 1 mile of river are late. Rivers with from 8 to 10 miles are medium. Rivers with from 10 to 15 miles are early. Rivers from 20 miles and above are very early." In proof of the correctness and general applicability of this theory, Mr. Buckland gives a list of about forty salmon rivers in England and Wales to which the above rules had been successfully applied; and he further states that, on applying his rules to the Rhine and the Tay, they were found to answer perfectly. Unfortunately Mr. Buckland's rules will not do when applied to the Scotch rivers; the exceptions being so numerous and important as entirely to invalidate the rules; and of this it is easy to give ample proof. The Thurso—perhaps the best angling river in Scotland—has a length of 40 and a catchment basin of 162 miles: that is to say, it has less than 5 square miles of catchment basin to 1 mile of course, and should, therefore, according to Mr. Buckland's theory, be "*very late.*" But, on the contrary, it is matter of notoriety that it is

the *earliest* river in Scotland, containing clean fish in December and January, and opening for angling on the 10th of the latter month. The Naver, the largest and best salmon river in Sutherlandshire, has a length of 24 and a catchment basin of 186 miles, or 7·75 square miles of catchment basin to 1 mile of length. It should, therefore, be late, while, in fact, it is one of the earliest rivers in Scotland, having clean fish almost as soon as the Thurso. The Brora, with a catchment basin of 6·8 to 1 of length of course, should likewise be "late," instead of which it is very early. The Nith has a catchment basin of 8·70 to 1 of length of course, and, according to Mr. Buckland's rule, it should be a "medium" river, whereas, as is well known, it is one of the latest, if not the very latest, of the Scotch salmon rivers, clean fish seldom appearing until May or June. The Annan, with 11·50 of catchment basin to 1 of length, should be an "early," whereas it is quite a late river. The rivers on the west coast of Sutherlandshire, Ross-shire, and Inverness-shire, are all late; yet, according to the rules which Mr. Buckland applies to the English rivers, many of them should be "early" or "very early." Thus the Laxford, with 22 miles of catchment basin to 1 of length, and the Ewe, with 52 miles of catchment basin to 1 of length, should be "very early," whereas they are both late rivers. Then the Inver, with 10 to 1, and the Kirkaig, with 12 to 1, should be early instead of late; whilst the Morar, with 65 to 1, and the Shiel, with 60 to 1 of catchment basin to length of course, should be "very early," instead of which we find that they are both late

salmon rivers. But it is needless further to multiply instances to show that the test-rules which Mr. Buckland appears to apply successfully to the rivers of England, signally fail when applied as "Nature's definite law" to the streams of Scotland, though there are some, such as the Tay, Ness, and others that might be mentioned, to which they will apply.

It may be stated generally that the Scotch rivers that fall into the German Ocean and the Pentland Firth are early, whilst the streams that run into the Atlantic Ocean are late. What is the cause of this? As has been already stated, we have seen that the lake-at-the-head theory, and the more recent theory applied by Mr. Buckland to the English rivers, will not account for this difference. I do not presume to construct a theory to account for it, but I venture to hazard a conjecture, the truth of which further observation may establish or overthrow. It is this: The Scottish rivers flowing into the German Ocean are almost all early rivers. They have comparatively long courses, and fall into the sea at considerable distances from their mountain sources, after running during some part of their career through districts not greatly elevated, and possessing a moderate climate. But the German Ocean, into which these comparatively warm rivers flow, is a cold sea, and the slight difference between its temperature and that of the rivers running into it in winter and spring induces the salmon to ascend early. Take the Tay, for example. It is well known that salmon run into it in great numbers in the months of December and January; so that when the fishing begins in February,

Loch Tay is fully stocked with clean and heavy fish. On the west coast, on the other hand, the rivers that fall into the Atlantic Ocean are all late. They have short courses, and their sources are much tilted up as they rise in that lofty and singularly picturesque chain of mountains, which, beginning not far south of Cape Wrath, skirts the shores of Sutherlandshire, Ross-shire, and Inverness-shire for more than one hundred miles, at distances varying from five to twenty miles from the western sea. In winter and spring, these mountains are snow-clad, and every partial melting of their snows brings down torrents of ice-cold water, which run through the short channels of these rivers into the sea. But the water of that sea, unlike that of the German Ocean that washes our eastern shores, is warmed by the soft influence of the Gulf Stream, and the salmon consequently remain in it until the snow-water has run off, and the milder weather of May and June has raised the temperature of the river waters, and then they begin to ascend. This marked difference in the physical characteristics of the rivers of our eastern and western seaboards is very clearly shown in the hydrographical map prepared for the Rivers' Pollution Commission, which faces page 24 of their sixth and last Report.

The rivers that run into the Pentland Firth are mostly early. The chief of these are the Thurso and the Naver, the former undoubtedly the earliest river in Scotland, and the latter not much behind it in this respect. The Thurso is forty and the Naver twenty-four miles long, both having much longer courses, and

traversing a less lofty and rugged country than the late rivers on the west coast of Sutherlandshire. I have never personally tested the temperature of the water of these rivers, and of the sea into which they fall; but in a letter received from Mr. Thomas Tod Stoddart, the well-known author and angler, he states that he perfectly recollects that Mr. Horsburgh, formerly factor to the Duke of Sutherland in the Tongue district, told him that the winter temperature both of the Naver and Thurso, and of the sea at their mouths, is four degrees higher than that of our southern rivers. It would be interesting to have a series of observations, by means of maximum and minimum thermometers, on the temperature of these rivers and the sea into which they fall, along with a similar series of observations—say on the Laxford and the Inver—two of the best of the late rivers on the west coast of Sutherlandshire. The Duke of Sutherland has displayed great energy and ability in promoting, in various ways, the improvement of the magnificent county of which he is almost the sole proprietor. If he would establish stations for observing the relative temperatures of sea and river on one early river—say the Naver or Brora—and on one late—say the Inver or Laxford—the cost would be but small, while the results would probably be both interesting and practically useful.*

* The conjecture I have here ventured to throw out with regard to the cause of earliness or lateness in salmon rivers was first brought forward by me in the 'Scotsman' newspaper in October and November, 1875. Its correctness is now being tested by the Scottish Meteorological Society on the Ugie, and, I believe, also by the Duke of Richmond on the Spey and the

Salmon Fishery Law and Legislation.

A detailed account of the laws affecting the salmon fisheries in the United Kingdom can scarcely be expected in a small and popular treatise like the present. But, at the same time, it might justly be deemed incomplete without some general statement of the leading doctrines of these laws, and of the principal statutes that regulate the salmon fisheries of the British Islands. I shall therefore endeavour to give such a summary in as few words as possible.

The law of England differs in some important particulars from that of Scotland with regard to rights of salmon fishing. The general rule is that the public have a *primâ facie* right to fish in the sea, and in navigable rivers; and that as regards rivers which are not navigable, the riparian owners to whom the banks of the river and subjacent soil belong, have *primâ facie* the exclusive right of fishing. In estuaries and navigable

Tweed Commissioners on the Tweed. Mr. Thomas Tod Stoddart, Mr. Paxton, Superintendent of the Tweed Fisheries, and other competent authorities, whose evidence will be found in the Reports on the Natural History of the Salmonidæ of the Tweed, published by the Messrs. Blackwood in 1867, speak strongly of the importance of temperature as an element affecting the lateness or earliness of salmon rivers; and Mr. Buckland, when examined before a Select Committee of the House of Commons, in April, 1870, in answer to a question from Mr. Whitwell, says: "I think that if a system of regular observations of temperatures were established throughout every district in England, there would, in the first place, be no difficulty in carrying it out, and, secondly, I think that it would probably throw great light upon the causes of rivers being early and late."

rivers, however, an individual may prove a right to a several or exclusive fishery, and so may prevent all other persons from fishing therein; and in a private stream, the original owner may have granted away the right of fishing while retaining the riparian ownership. When there is a riparian owner on each side of a stream, the presumption of law is that the property of each, and consequently his exclusive right of fishing, extends to the *medium filum* or mid-channel line. "In England," says Mr. Paterson, in 'The Fishery Laws of the United Kingdom,' "there are four descriptions of fishery. A common fishery is that kind of right which all the public have alike to fish in the sea or a navigable river. A several fishery is the right of an individual to fish exclusively in a particular water, and it is not necessarily united with the right to the soil, though originally all owners of the bed of a river must have had a several fishery in such water as a constituent part of the right of property, until they parted with it to another. A free fishery is the right of fishing with other individuals in a water. A common of fishery is the right of a person to fish in waters of which the soil belongs to a different person, and is analogous to a common of turbary or pasture. In reality, a free fishery and a common of fishery scarcely differ, except in the mode in which the right was acquired."

The existing law with regard to the salmon fisheries of England is contained in six Acts of Parliament, including the Act of 1870 relating to trout and char, the first of these, which passed in 1861, having repealed

the twenty-six public statutes which related to salmon. I take the following admirable summary of the chief provisions of the Acts now in force, from Mr. Willis Bund's excellent work on 'The Law relating to the Salmon Fisheries of England and Wales, as amended by the Salmon Fishery Act of 1873.' "The multiplicity, confusion, and uncertainty of the law rendered it practically inoperative, and one of the causes to which the Royal Commission of 1860, that was appointed to inquire into the decay of the salmon fisheries in England and Wales, attributed their decline, was this confusion and uncertainty of the law. Accordingly the Salmon Fishery Act of 1861, which was based upon the report of that Commission, repealed all the previous Acts and became the foundation of the present law. That Act prohibited certain ways of destroying fish, as by polluting the water, using lights or spears for taking salmon, using small meshed nets, new fixed engines, and the capture of fish at mills and weirs. It prohibited the capture of unclean and unseasonable salmon, and the young of salmon; made an uniform close season for England and Wales; introduced a weekly close season of forty-two hours; made provision for the erection of fish-passes over dams, and placed restrictions upon the use of fishing weirs; vested the central authority of the salmon fisheries in the Home Office, and provided for the appointment of inspectors to see that the law was thoroughly carried out. Although the Act prohibited the sale of salmon in England and Wales during close time, it did not contain sufficient provision to meet the case of the

capture of unseasonable salmon in England, and its exportation abroad, especially to France, for sale. Accordingly, in 1863, an Act was passed prohibiting the exportation of salmon during the annual close time. In carrying the Act of 1861 into execution, various defects were found in it: no local authority was legally constituted to carry out the Act, and no provision was made for raising funds to protect the rivers. To meet these difficulties the Salmon Fishery Act of 1865 was passed, which provided machinery by which all the salmon rivers in the country might be divided into fishery districts, placed under the control of local boards of conservators, elected by the magistrates in quarter-sessions. To these bodies the management of the fisheries was given, and they were authorized to raise the money necessary for protecting the river, by enforcing a license duty upon the instruments used in their district for the capture of salmon. They were also empowered to appoint water-bailiffs to protect the fisheries, and see that the law was duly carried out. It was found, that as fish increased, the engines for their capture, and especially fixed engines, increased in the same proportion. The legality of many of these engines was very doubtful; but if any person was charged with using an illegal engine, he at once set up a claim of right, and thereby ousted the jurisdiction of the magistrate in the case, leaving the board of conservators to the costly and uncertain remedy of an action at law if they disputed his right to use the engine. The Act of 1865 accordingly constituted a tribunal for the trial of the legality of these engines,

the Special Commissioners of English Fisheries, whose duty it was to decide upon the legality or illegality of every fixed engine for catching or facilitating the capture of salmon throughout the country. In 1870, it having been found that the Salmon Exportation Act was evaded by the capture of unclean salmon in the open time in England, and exporting it to France, an Act, the Salmon Acts Amendment Act 1870, was passed, which extended for the time during which it is presumed that the exportation of salmon is illegal to the 30th of April in each year.

"The Special Commissioners of English Fisheries having finished, or nearly finished, the work for which they were appointed, were discontinued by an Act passed in the beginning of 1873.

"The Salmon Fisheries Act 1873 is the latest addition to salmon legislation; it is intituled 'An Act to amend the laws relating to Salmon Fisheries in England and Wales.' It amends and extends the law as to fishery districts, the modes and times of taking and selling fish, the issuing of licenses, the powers of water-bailiffs, the law as to the erection of fish-passes and gratings to artificial channels, and introduces two new and most important principles:—(1.) To the constitution of boards of conservators a representative element is added; the fishermen in public waters for every fifty pounds of license duty they pay, elect a member. (2.) Power is given to boards of conservators to make bye-laws for the better protection, preservation, and improvement of the salmon fisheries within their district. This power, so long agitated for

by the various fishery boards, who have for some time past discovered that the varying circumstances of each river require special legislation to meet them, is certainly the most valuable provision of the Act of 1873, and one from which great good to the fisheries of England and Wales may reasonably be anticipated."

The common law in *Ireland* regarding the right of salmon fishing is the same as that of England; but there is some difference in the statutory law. The laws regulating the Irish fisheries, comprised in a variety of statutes, extending from the time of Edward the Fourth to that of George the Fourth, were all repealed by the general Act (5 & 6 Vict. c. 106) which consolidated and amended the law. Several other Acts were subsequently passed; and finally, "The Salmon Fisheries (Ireland) Act 1863." Under this last-mentioned Act, special fishery commissioners are appointed, to whom nearly all the powers of the former Irish Fisheries Commissioners are transferred. Ireland, like England, has been divided into fishery districts, with boards of conservators, clerks, and water-bailiffs. The Commissioners have power to alter close time, and many other details relating to the Irish fisheries. A scale of license duties from 1*l.* to 30*l.* is fixed for salmon rods, cross lines, head-weirs, cruives, &c. The license duty on fixed nets is 10*l.* for bag-nets, and 30*l.* for fly and stake-nets. All new fixed nets—that is, nets not legally existing in 1862—are illegal, and any person may destroy them. The net and fish are forfeited, and the

owner is liable to a penalty of from 5*l.* to 20*l.* per day. All bag-nets placed in rivers or estuaries, after July, 1863, or within 3 miles from the mouth of any river, are declared illegal, and the net and the fish captured by means of it are liable to be forfeited, and the owner incurs a fine of from 5*l.* to 20*l.* per day; but bag-nets legally existing within 2 miles of the mouth of a river, in the whole of which the owner has the exclusive right of catching salmon, are exempted. There is an excellent provision in the 9th section of the Irish Act of 1863, which might be introduced into any amended English or Scotch Act with great advantage to the fisheries. That section relates to gaps in fishing weirs, and is in the following terms:—"In every fishing weir there shall be a free gap or opening in accordance with the regulations following, under the powers of this Act; (that is to say,) (1.) The free gap shall be situate in the deepest part of the stream; (2.) The sides of the gap shall be in a line with, and parallel to, the direction of the stream at the weir; (3.) The bottom of the gap shall be level with the natural bed of the stream above and below the gap; (4.) The width of the gap in its narrowest part shall be not less than one-tenth of the width of the stream; provided always, that such gap shall not be required to be wider than 50 feet, and shall not in any case be narrower than 3 feet; and provided also, that no existing gap in any weir shall be reduced in width, or a gap of less width substituted in lieu thereof, or any alteration made therein so as to reduce the flow of water through such gap; provided also, that no person shall be entitled to

any compensation by reason of the enforcing of any free gap in any weir, anything to the contrary in any Act notwithstanding."

Otters, spears, lysters, and certain other implements are prohibited, as also fishing by night, disturbing spawning fish, poisoning rivers, fishing during the annual or weekly close times, and taking unclean or unseasonable fish. The weekly close time in Ireland is forty-eight hours—from 6 A.M. on Saturday, until 6 A.M. on the following Monday—being six hours longer than the English, and twelve hours longer than the Scotch weekly close time.

The law of *Scotland*, with regard to salmon fishings, differs in some important respects from the laws of England and Ireland. There is no such thing as a public right of salmon fishing known to the law of Scotland; and all the salmon fishings in the country, not only in rivers, but also in estuaries, and in the narrow seas, to at least 1 mile seaward from low-water mark, belong either to the Crown or the grantees of the Crown. Riparian ownership by itself confers no title to salmon fishings—not even to rod-fishing; and it sometimes happens that one person possesses the land on both sides of a river and the subjacent soil, whilst another has the right to the salmon fishings. A charter, with an express grant of salmon fishings, is required to constitute a valid right, or a charter, with a general grant of fishings, followed by forty years' prescription of salmon fishings, or a Barony title, fortified by a similar prescription.

Mr. Paterson, in his able and useful work on 'The

Fishery Laws of the United Kingdom,' says (p. 174), when treating of the fishery laws of Scotland, "The riparian owner has always the right of rod-fishing, for salmon as well as for other fish, as an incident of his right of property;" and afterwards, on pages 223, 224, he says, "The right of angling for salmon does not, like the right of fishing salmon with nets, depend on a grant from the Crown, but it is an incident of property, and one of the riparian rights. The Crown can, in general, neither give nor take away the right of angling; therefore, even though another person has a grant from the Crown of the salmon fishing at a particular part of the river, yet, the owner of the banks may fish salmon with the rod, provided his doing so does not substantially interfere with the higher right of the Crown grantee." The writer of the article "Salmon," in Chambers's Encyclopædia, also maintains the same doctrine. "The right to angle for salmon," he says, "is not derived from the Crown, but belongs to the riparian owner, who may angle for salmon, so long as his doing so does not prejudice the net-fishing." Both the above statements, however, are erroneous. Angling forms no exception from the original right of the Crown, which extends to every method by which salmon can be captured; so that a riparian owner, with nothing beyond the right derived from such ownership, has no more right to angle for salmon, in the river bordering or running through his lands, than he has to capture them by means of net and coble. This was finally decided by the Court of Session in the case of *Anderson* v. *Anderson*, 25*th November*, 1867, in

which the judges unanimously held that the riparian proprietor, as such, has no right to fish for salmon by the rod, and that any passages in the books, which might seem to favour such a theory, have been misinterpreted.

The principal Acts which regulate the salmon fisheries in Scotland are, "The Salmon Fisheries (Scotland) Act, 1862," and "The Salmon Fisheries (Scotland) Act, 1868." But the example of England and Ireland was not followed in one important respect in these Acts. There was no clause and schedule repealing the old Acts relating to salmon fishings; and the consequence is that, in Scotland, in addition to these recent Acts, there are a great number of other statutes still in force, some of them dating more than 400 years back, so that the mass of legislation affecting salmon fishings has become cumbrous and complicated. On the inconvenience and evil attending such a state of things, the Special Commissioners wrote as follows in 1871.* "It seems worthy of careful consideration, in contemplation of another Scotch Salmon Fishery Act, whether it would not be better, instead of making it an amendment of the general Acts of 1862 and 1868, to make it a totally new and independent measure, repealing the mass of legislation that at present applies to the subject, and embodying as shortly and clearly as possible the provisions that are considered most essential for the protection and development of the fisheries. At present there are many ancient Scotch statutes

* See Report by Messrs. Buckland and Young, the Special Commissioners appointed to inquire into the effects of recent legislation on the salmon fisheries in Scotland, p. 33.

wholly or partially in force, as well as several more recent Acts; while, on the Solway, there are—besides certain ancient Scotch Acts — the Solway Act, the Annan Act, the English Acts of 1861 and 1865, and the Scotch Acts of 1862 and 1868. Acts have been added to Acts, and amendments piled on amendments, until, in the multiplicity and confusion of salmon legislation, it is difficult to know what is legal and what illegal, what to do and what to avoid. It is time that such a state of things were remedied. There may, indeed, be much doubt and difference of opinion as to the proper remedies to apply, but some progress towards a cure would surely be made by sweeping away the complicated legislation that at present embarrasses the subject, and embodying in a single new Act all the points essential to the development of the Scotch salmon fisheries."

Under the Acts of 1862 and 1868, Scotland has been divided into fishery districts, which are managed by district boards, constituted in conformity with the directions in the Acts. But not above a third of the rivers in Scotland have as yet had district boards constituted. Estuaries have been fixed for the various rivers, and the commencement and termination of the annual close time—which must always be 168 days—have also been determined. The due observance of the weekly close time; the construction and use of cruives; the construction and alteration of mill-dams, or lades, or water-wheels, so as to afford a reasonable means for the passage of salmon; and the meshes of nets (so that they shall not intercept smolts or salmon-fry), have been fixed by bye-laws framed by the Scotch

Commissioners, and approved by the Secretary of State, which now form parts of the Acts of 1862 and 1868. Certain modes of fishing, and certain implements, are prohibited by the Acts. The duties and powers of the Scotch Commissioners, and of district boards and their officers, are defined, and night poaching is made severely punishable. The use of salmon-roe is forbidden. Penalties are imposed for taking unclean salmon, and for buying and selling salmon during close time; while provision is made for the removal of boats and other engines during the annual close time, and for the prosecution of offences on boundary rivers, or on the sea-coast. In Scotland, although its salmon fisheries are more than three times as valuable as those of England, there are no Inspectors or Inspecting Commissioners of salmon fisheries as in England and Ireland, and no annual reports are published, as in these countries, with regard to the state of the fisheries. The weekly close time in Scotland is thirty-six hours; from 6 P.M. on Saturday night, until 6 A.M. on the following Monday. In Ireland, as we have seen, it is forty-eight hours, and, in England, under the Act of 1873, forty-two hours, with a power of extension, by bye-laws made by boards of conservators, to forty-eight hours.

In spite of the unquestionable improvements introduced by the Acts of 1862 and 1868, much still remains to be done before the Scotch salmon fisheries can be considered as established on a satisfactory footing. As these Acts at present stand, stake-nets and bag-nets may be placed far too near the mouths of rivers; there being, at least twenty rivers, with estuaries so fixed by

the Commissioners under the Act of 1862, that such nets may be placed at distances varying from 400 to 150 yards from the mouth of the river on each side, measured from a point fixed in mid-channel. Such estuaries imperatively call for revision and enlargement, in order to give the fish a fair chance of ascending to the upper waters. No fixed net should, in any case, be allowed to be placed nearer than half a mile from the mouth of a salmon river, and none should be permitted between the mouths of rivers that flow into the sea within a short distance of each other, such as the Dee and Don, in Aberdeenshire, and the Ayr and Doon, in Ayrshire. At present, there is no definition of what constitutes a fixed engine in the Acts of 1862 and 1868. This omission ought to be supplied in any future legislation. The following, it is thought, would be an unobjectionable definition:—"From and after the passing of this Act, the terms, fixed net and fixed engine, shall respectively mean and denote any net or engine used, or which may be used, for the capture of salmon, saving and excepting fishing by net and coble, as lawfully used and practised at the time of the passing of this Act." The Secretary of State should have power to amalgamate and divide fishery districts as in the English Act of 1873. The constitution of district boards should be revised. As at present constituted, the upper proprietors complain that they—in whose waters the salmon are bred—have too little power; and that they have no interest to preserve the fish and prevent poaching, as only a miserable remnant of salmon is permitted to reach their waters during the fishing season, and that, until the nets are off, the lower

proprietors have a practical monopoly of the fishings. Further provision should be made for the abatement of pollutions and the removal of obstructions in rivers and estuaries to the passage of salmon. The Scotch Commissioners should be empowered to make annual or biennial inspections and reports. The weekly close time should be extended. Some provision should be made against over-netting by net and coble in the lower stretches of great rivers—such as the Tay, for example—similar to that in the 14th section of the English Act of 1873, which provides, that no draft-net shall be shot within 100 yards of another, until the latter is landed. The sale of salmon caught with the rod during the extension of time for rod-fishing should be prohibited. The use of the gaff for landing salmon should be forbidden from the beginning of the fishing season in every river until the 1st of June; and there should be a close time for trout and char as in the English Act of 1873, and the Irish Act of 1850. Within its own district, every district board should have the same powers to prosecute for the removal of obstructions in rivers and estuaries to the passage of salmon, as are at present competent to the individual proprietors of such board. As the law stands, every individual proprietor of salmon fishings has admittedly a right to raise an action for the removal of such obstructions. But, as the original Commissioners, under the Act of 1862, neglected to make a bye-law with regard to such obstructions as empowered by the said Act, the best legal authorities in Scotland hold, that district boards have no title to prosecute, which undoubtedly they ought to have. In like manner, every

district board within its own district should have all the powers of prosecution for the removal or abatement of pollutions in rivers and waters as are at present competent to the individual members of such board. It is notorious in Scotland, that the clauses in the Acts of 1862 and 1868, intended to prevent the pollution of salmon rivers, have signally failed in effecting the object for which they were enacted, so that no attempt is now made either by district boards or by private parties to put them in force. District boards are, therefore, at present quite unable to put down pollutions because, being the creatures of statute, they cannot travel beyond the statutes which create them and define their powers, and have, consequently, no title to prosecute under the rule of common law, that no upper proprietor has a right to pollute a stream, to the injury and nuisance of a lower proprietor.*

* During the last session of Parliament a Rivers' Pollution Prevention Act was passed, after it had been carefully divested of most of the provisions which could make it objectionable to polluters. It is to be hoped that it will not destroy or impair the common law rule above stated, under which the Duke of Buccleuch was enabled to gain his case against the polluters of the Esk, and certain riparian proprietors on the Almond were likewise successful against the polluters of that river. In their recent Report, the Council of the "Association for Preserving the Rivers and Lochs of Scotland" strongly censure the imperfections of this Act. "The Council," they say, "feel so strongly the defective nature of the provisions of the Act of Parliament passed last session for preventing the pollution of rivers and streams in Scotland, that they recommend that a deputation of the Association should be appointed to wait upon the Lord Advocate for Scotland, in order to point out to his Lordship the imperfections of the Act, in the hope that he will be induced to introduce and carry through Parliament a measure better suited for effecting the objects desired."

Natural Obstructions.

There are scarcely any salmon rivers on which there are not obstructions of some kind; but, as might be expected from the mountainous character of Scotland and the wild and rugged scenery through which many of her salmon rivers run, there are numerous natural obstructions to the ascent of salmon, which, at present, close up an extensive area of valuable spawning ground, and prevent many large and beautiful lakes from being as well stocked with salmon and sea-trout as Loch Tay, Loch Stack, Loch Shiel, or the Grimersta Lochs in the island of the Lews. The following list of these obstructions, and of the extent of river and loch closed up by them, may be found interesting:

Name of Obstruction.	Extent of River and Loch closed, in Miles.
Falls of the Tummel (District of the Tay) ..	100
„ „ Lochy „ „ ..	15
„ „ Garry „ „ ..	15
Reekie Linn, river Isla „ „ ..	10
Falls of Mounessie (District of the Lochy) ..	40
„ Mucomer „ „ ..	40
„ the Clyde (District of Clyde and Leven)	50
„ „ Shin (Kyle of Sutherland)	40
„ „ Cassley „ „	10
„ „ Conon (District of the Conon)	20
„ „ Rasay „ „	15
„ „ Orrin „ „	15
„ „ Morriston (District of the Ness) ..	20
„ „ Farigaig „ „ ..	10
„ „ Morar (District of the Morar)	15
„ „ Falloch (District of Clyde and Leven)	8
Carried forward	423

Name of Obstruction.	Extent of River and Loch closed, in Miles.
Brought forward	423
Falls of the Inveruglas (District of Clyde and Leven)	5
Linn at Blarquhan (Girvan District)	10
Falls of the Minnock (Cree District)	10
„ „ Divie (Findhorn District)	10
Falls on river at head of Loch Aline (Aline District)	8
Falls of the Kirkaig (District of the Kirkaig) ..	12
Total extent of river and loch, wholly or partially closed by natural obstructions ..	478*

Perhaps the most successful example of the overcoming of a great natural obstruction to the passage of

* A pass is now being made at the Falls of the Morriston which will convert that stream from a trout into a salmon river, and will enable salmon to ascend to the ample reservoir of Loch Clunie—seven miles long—in which it has its source. Some of the other obstructions, from their great height, and the force and velocity of the water, are practically insurmountable, such, for example, as the Falls of the Clyde, and even if they were made passable, the manifold pollutions which contaminate the Clyde at and below Glasgow would probably seriously interfere with the free ascent of salmon. In other cases, such as those of the Conon, Kirkaig, Aline, Farigaig, the expense which would be incurred in making the obstacle passable would never be repaid by the increased produce of salmon. A full account of these natural obstructions will be found in the Report of 1871, drawn up by Mr. Buckland and the writer of the present treatise, on the effects of recent legislation on the salmon fisheries in Scotland, pages 18–22. At present, district boards have no powers to remove natural obstructions, or render them passable for salmon, except by agreement with the proprietor or proprietors; and, in several cases, there are certain legal difficulties in the way. These will be found detailed in my 'Notes on the Scotch Salmon Fishery Acts of 1862 and 1868,' pages 16–22. Edinburgh, Edmonston and Douglas, 1874.

salmon, and the creation of a valuable salmon fishery where none had previously existed, is afforded by the fishery at Ballisodare, County Sligo, Ireland. At the mouth of the river there are three precipitous cascades of the united height of 50 feet, perfectly impassable by salmon until Mr. Cooper, the proprietor, took steps to enable them to ascend. The salmon ladders which Mr. Cooper erected enabled the fish to find their way to the upper streams and lakes. These ladders allow the fish to pass first the perpendicular rock of 30 feet over which the river falls into the tideway; second, the falls at Ballisodare mills; and lastly, the falls at Colloonay. Before their erection not a single salmon ever surmounted these barriers; but after their construction, the fish were able to ascend with the greatest ease. A valuable salmon fishery was in fact created, where none had previously existed; and eleven years after the construction of the ladder, 10,000 salmon were caught in a single year. Here we see the astonishing results attained in a river, previously entirely unproductive, in the course of a few years, unaided by any artificial propagation of salmon ova, but simply by affording free access to the breeding grounds above the falls, and protecting the salmon while there, and thus enabling them to reproduce their species in a natural way.

The late Mr. Ashworth, of the Galway fisheries, furnishes another example of the rich reward that may be derived from the enlightened management of a salmon fishery. By removing all obstructions to the free access of salmon to the upper waters, by a lengthened close time, and by artificial propagation, he succeeded in increasing the rental of his fishery tenfold in

the course of as many years. The following table will afford an idea of the extent of this increase:

In 1853 the number of salmon taken was				1,601
„ 1855	„	„	„	5,540
„ 1858	„	„	„	9,639
„ 1861	„	„	„	11,051
„ 1864	„	„	„	20,512

Artificial Obstructions.

Natural obstructions, as has been already shown, block up a great extent of valuable spawning ground, especially in Scotland; but what the salmon fisheries suffer from natural obstructions, is as nothing to what they suffer from the innumerable artificial obstructions created by mills and manufactories.

Mr. Walpole, Inspector of Salmon Fisheries for England and Wales, points out, in his Report for 1869, that the area, in these countries, suited for the cultivation of salmon is 46,000 square miles, and he then gives the following table of rivers:

	Sq. Miles.
Rivers draining each above 1000 square miles	24,398
„ „ 500 „	7,385
„ „ 250 „	3,634
	35,417

Productive of salmon:

	Sq. Miles.
Class A. Rivers above 1000 square miles ..	3,500
„ B. „ 500 „ ..	3,500
„ C. „ 250 „ ..	2,000
	9,000

"Let us briefly point out," he proceeds, "what these facts mean. The streams which drain 46,000 square miles of country are physically capable of producing

salmon. Of these, in round numbers, 36,000 square miles, or more than three-fourths of the whole area, are drained by rivers in one of these three classes, and of this 36,000 square miles, salmon are practically excluded from 27,000 square miles, or exactly three-fourths of the whole. It is true that this calculation is in some respects imperfect; a few fish are produced in some rivers like the Trent, the Wiltshire Avon, and the Dovey, and I have not credited the fish which such rivers produce, but, on the other hand, I have omitted obstructions which materially interfere with the passage of fish. For instance, every inch of spawning ground on the Severn is shut out by weirs. The Tees is blocked by a difficult weir at Dinsdale. So that if I had dealt with the case as I should have been justified in dealing with it, I should have been easily able to show a still more startling state of things. But even as things stand, it follows that, notwithstanding the legislation of 1861, out of 36,000 square miles of country which ought to be productive of this most valuable fish, only one-fourth, or a little over 9000 square miles, produces salmon at all."

Since this was written, a number of dams formerly impassable by salmon have been rendered passable by means of salmon ladders; but a great deal still remains to be done in this direction, before the ascending fish can have anything approaching to free access to the spawning grounds in the upper waters.

The following is a list of the passes at work in England and Wales taken from the last Report of the English Inspectors:

LIST OF PASSES AT WORK IN ENGLAND AND WALES.

Axe	At	Westwater	Works well.
Camel	„	Dunmere	Works fairly.
Coquet	„	Acklington	Works well.
„	„	Warkworth	Not finished.
„	„	Felton	Works well.
Dart	„	Kilberry Mills ..	„ „
Dee	„	Erbistock	„ „
„	„	Llangollen	„ „
Dovey	„	Dinas Mawddy ..	„ „
Fowey	„	Doublebois	„ „
Kent	„	Levenshall	„ „
Lune	„	Skirton	„ „
Leven	„	Blackbarrow	„ „
„	„	Weir, near Lake Windermere.	„ „
Ribble	„	Clitheroe	„ „
Severn	„	Llanthony	„ „
„	„	Diglis, Three passes	Fairly successful.
„	„	Tewkesbury	Works well.
„	„	Bevere	Very good.
„	„	Holt	Works fairly.
„	„	Lincomb	Lately erected.
„	„	Pool Quay	Acts indifferently.
„	„	Penarth	Works well.
„	„	Milford	Acts fairly.
„	„	Powick	„ „
„	„	Bransford	Works fairly.
„	„	Abertanat	„ „
Stour, Canterbury	„	Black Mill	„ „
Tamar and Plym	„	Tavistock	„ „
„ „	„	Latchley	„ „
Tyne	„	Warden	Acts fairly.
„	„	Otterburn	Works well.
„	„	Chollerford	„ „
Taw and Torridge	„	Collaton	Lately erected.
Tees	„	Dinsdale	Works fairly.
Usk	„	Forge	Works well.
„	„	Newton	„ „
„	„	Brân	„ „
„	„	Tarell	„ „
„	„	Senny	„ „
Wharfe	„	Tadcaster	Acts fairly.
„	„	Washburn Foot ..	„ „
„	„	Wetherby	Fairly successful.

In Scotland, too, there are hundreds of miles of valuable spawning ground sealed against the entrance of salmon, either by dams without salmon ladders, or with salmon ladders so badly constructed as to be quite useless for facilitating the ascent of fish. In 1860, Mr. Cathcart of Auchendrane, gave evidence before a Committee of the House of Lords that, on the Ayrshire rivers alone, there were eighty-one dams or weirs, and that only two of these had any "statutory slaps" in terms of the old Scotch Statutes. There has been some improvement, but not a great deal, since Mr. Cathcart gave that evidence. The Irvine and the Ayr may be said to be almost salmonless. The Doon, from weirs and pollutions, is in scarcely a better state, though naturally a river admirably well suited for the production of salmon. The Girvan is still very much obstructed; and the only good salmon river in the whole county is the Stinchar, where the salmon are both tolerably numerous and of a large average weight for a small river. Besides these dams on the Ayrshire rivers, there are many more on the other rivers of Scotland, in addition to at least nine cruives.* The worst artificial obstructions on any river in Scotland are the series of dams on the river Ericht, above the bridge at Blairgowrie. There are six of them in the space of little more than a mile, entirely barring the passage of fish, and utterly ruining what used to be, forty years ago, one of the best salmon rivers in Perth-

* Particulars with regard to these will be found in the Report of 1871, by Mr. Buckland and myself, on the effects of recent legislation on the salmon fisheries in Scotland, Appendix ii. pp. 16–29.

shire. The Ericht, above the Bridge at Blairgowrie, is now salmonless, and the fine stretch of spawning ground in its head waters—the Shee and the Ardle—is rendered quite useless. Yet, according to an old valuation roll of the county of Perth, the annual value, in 1835, of only a small part of the salmon fishings in the mile of the Ericht above the bridge at Blairgowrie, now destroyed by these dams, was 164*l.* 17*s.*

But though much remains to be done to improve the Scotch rivers by putting passes into dams where none now exist, and by improving inefficient passes, there are some examples of admirable salmon ladders to be found in the country, chief among which is the ladder at Deanston Mills on the Teith, the principal tributary of the Forth. This ladder has a very easy gradient, and is more than four times as wide at the bottom as at the top. The following are its dimensions:

Length of salmon ladder	250 feet
Gradient	1 in 27 „
Width of ladder at top	9 „
„ „ bottom	40 „
Height of side wall at top	4 „
„ „ bottom	12½ „
Crossbeams 1 foot deep and 12 feet apart (except the three upper spaces, which are respectively 8, 9, and 10 feet).	
Total width of weir on sill	248 „

There is another model pass, though on a much smaller and cheaper scale, on Morphie dam, on the North Esk, in Forfarshire, perhaps the most productive salmon river of its size in Great Britain. It is

quite a simple pass, without pools or stops, and was put in by a practical fisherman of the name of Scott, belonging to the district, at an expense not exceeding 100*l*. I had the water turned off, in order that I might examine it carefully. The sides and bottom of the pass are formed of rough stones, which serve not only to break the force of the water, but also to assist the ascent of the fish. Nothing can be worse than smooth, highly-finished stonework for the flooring of a pass. The gradient is easy—about 1 in 11 or 12. The depth of the pass is 20 inches; and the breadth at the top is five feet, gradually widening out until it is nearly twice that width at the bottom. The length is about 70 feet. This pass has been in operation for many years, and so successful has it proved, that, during the first week of the fishing season, 1000 salmon, on an average, are taken annually from the pools below Craigo dam, an obstruction nearly 5 miles above Morphie, with a pass in it which has been recently much improved after a protracted litigation between the district board and the proprietor, but which does not yet afford sufficient facilities for the ascent of spring fish.

Pollutions.

Pollutions are another fertile source of injury to the salmon rivers of the United Kingdom; and a very slight glance at the map of the polluted river basins of Great Britain in the Sixth Report of the Rivers' Pollution Commissioners will be sufficient to convince the most sceptical of the immense extent to which the

evil has been allowed to spread. This is the more to be regretted when we find the Rivers' Pollution Commissioners in their Fifth Report writing as follows: "We have thus already submitted to your Majesty a description of the evils arising from the discharge into river channels of town sewage, and of the various filthy drainage waters from cotton, woollen, silk, flax, and jute works, from print and dye works, from tanneries, paper mills, and bleach-works, from alkali, chemical and soap works, from distilleries, starch and sugar works, and from paraffin oil works. *The remedies for the nuisances which these refuse liquids create have been carefully examined, and after prolonged inquiry and research, we have been able to report that in every case efficient remedies exist, and are available; so that 'the present use of rivers and running waters for the purpose of carrying off the sewage of towns and populous places, and the refuse arising from industrial processes and manufactures, can be prevented without risk to the public health or serious injury to such processes or manufactures.'* "

In the Reports of the English and Irish Inspectors of Salmon Fishings, we find repeated complaints of the injurious effects of pollutions, of its yearly increase, and of the futility of the means for checking it which boards of conservators possess. In his Report of 1876 Mr. Buckland writes as follows: "Although the salmon rivers of England have undergone so much cultivation since the Act of 1871 was passed, there is a point to which I wish to call most serious attention; it is the pollution of rivers. It may be said that this question of 'clean versus polluted water' is too large

to be dealt with from a fishery point of view. Of late years, however, pollution has so much increased in our rivers, that the matter has assumed a national character, and the health, not only of the fish, but also of the public in general, is in peril. The following table will show the present position of our principal salmon rivers, as regards pollutions:

Rivers.	*Pollutions.*
Axe	Suffers from sewage.
Camel	„ china clay, mines.
Dart	„ chemicals, mines, paper works, wool washings.
Dee	„ oil and alkali works, petroleum, paper works, wool washings.
Dovey	„ mines.
Ellen	„ coal washings, tan, mines.
Eden	„ sewage, tan, mines.
Exe	„ sewage, paper works.
Fowey	„ china clay works, mines.
Kent	„ manufactures.
Lune	„ paper works.
Medway	„ manufactures.
Ogmore	„ coal, tan, sewage.
Ribble	„ sewage, factories, chemicals.
Rhymney	„ ruined by pollutions.
Severn	„ sewage, mines, tan, dye works.
Stour, Canterbury	„ sewage.
Tamar and Plym ..	„ mines and clay works.
Taw and Torridge	„ sewage.
Tees	„ mines, sewage.
Teify	„ débris from slate quarries, mines.
Teign	„ mines.
Towy	„ mines, chemicals.
Trent	„ sewage, factories.
Tyne	„ chemicals, mines, coal washings.
Usk	„ tin-plate works, iron works, lime, ashes, coal washings, sewage.
Wye	„ mines, tin works, sewage.
Wear	„ ruined by mines.
Yorkshire rivers ..	„ tan, lime, factories, sewage.

"Thus it will be seen that the best salmon rivers in England and Wales are nearly all suffering from pollutions of some kind or another, generally mines at the top, and chemicals, paper works, and other factories, sewage, &c., from the towns through which they flow."

If we turn to the Irish salmon rivers, pollution seems to be not nearly so common or on so great a scale as in the rivers of England. Yet we still find the Irish Inspectors complaining of the polluted state of many of the rivers under their jurisdiction. Thus Mr. Blake writes as follows in 1874, with regard to his district, which extends from Wicklow Head to Rossan Point, and includes the northern part of Ireland: "The great bane of the larger portion of the districts in my charge is the extensive poisoning by flax water, and the pollutions from bleach and paper works, &c. From these causes, nearly every river in the county Down has been destroyed, and considerable injury done to the rivers in the counties of Antrim and Londonderry. The evil with regard to flax might be considerably abated without injuriously interfering with the operations of the farmers, by the observance of a little care on their part, and involving but a trifling additional outlay. In many places the number of water-bailiffs is quite inadequate to enforce the provisions of the law with respect to flax steeping, and there is often an indisposition on their part to compel the farmers to do what is necessary to prevent the rivers from being contaminated. Until more assistance can be obtained from the constabulary, this terrible

destroyer of salmon life cannot be successfully grappled with." *

Although the majority of the highland streams in Scotland are uncontaminated by pollutions, the lowland rivers, and several of those in Perthshire, Forfarshire, and Aberdeenshire are very much polluted. In the Forth district, the Devon, Almond, Avon, Carron, Leven, and Esk are now wholly salmonless, owing to pollutions acting in combination with artificial obstructions; and the Forth itself near Stirling is terribly injured by paraffin refuse and town sewage. Eighty years ago the Fifeshire Leven rented for 300*l.* a year, and the late Mr. Christie of Durie told me that he remembered killing three salmon in it when a lad on a Saturday forenoon. Now it does not contain a single salmon; whereas if the water were as pure now as it was then, it would be worth 1000*l.* a year, taking the increase in the price of salmon into account. In the

* The Scotch Parliament seems to have been well aware of the evils arising from lint pollution, and one of the old Scotch Acts (1606, cap. 13) is directed against it in the following terms: "Our soveraigne Lord and Estaites of Parliament, finding that the laying of lint in lochs or burns is not only hurtful to all fishes bred within the same, and bestiall that drinks thereof; but also the haill waters of the said lochs and burns, thereby being infected, is made altogether unprofitable for the use of man and very noysome to all people dwelling thereabout. Therefore statutes and ordains that na person or persons, in time coming, lay in lochs and running burns, any green lint, under the pain of 40*s.* *toties quoties*, for ilk time they shall contravene; and also confiscation of the lint, to be applied to the poor of the parish within which the said lochs and burns lie."

Tay district, the Almond, Ericht, and Dighty, owing to the same causes, are entirely ruined, and the South Esk below Brechin is very much injured. Among the Ayrshire streams, the Irvine has been utterly destroyed as a salmon river by town sewage and other impurities, and the Ayr, Doon, and Garnock have also suffered terribly from pollutions of various kinds. The Leven (Loch Lomond) and the Clyde also team with pollutions; and the fisheries in the Nith, at and below Dumfries, are much injured from the same cause. Then, as to the Tweed, Mr. Spencer Walpole and I in our Report of 1875 to the Secretary of State on the operation of the Tweed Fisheries Acts wrote as follows: "We think that the Tweed Acts have failed to compensate the fisheries for the loss which they have sustained through the operation of land drainage, for the following reasons: 1st. The increasing pollution of the river; and 2nd. The wholesale poaching which is practised on it. Sections 65 and 66 of the Act of 1857 deal with the first of these subjects, and forbid the pollution of the Tweed by noxious substances or rubbish; but, unfortunately, it is matter of notoriety that they have proved utterly inadequate to prevent the great and yearly increasing evil which they were intended to remedy, and at this moment the sewage of all the towns on their banks, and the dyestuffs and refuse from all the mills and manufactories, are poured in a fetid stream into the Tweed and its tributaries, which are thus in some places so polluted as to be not only repulsive or destructive to fish, but also unfit for their primary use of affording wholesome

drink for man and beast. Indeed, so far has the evil gone, that, in the opinion of one experienced medical man, a good deal of sickness has arisen, and one death has occurred this year, owing to the poisonous qualities of the water on a polluted part of the river Whitadder. When we thus find the public health seriously affected, and the preservation and development of the salmon fisheries of the Tweed rendered almost impossible, we cannot help thinking that the secondary uses of water which the manufacturers enjoy, have been too long allowed to usurp the place of the primary uses to which the public are entitled, and that it is high time that some stringent measures were adopted to check the progress of pollution, which threatens, at no very distant date, to convert large portions of the main stream and its tributaries, formerly pure and productive, into foul and pestilential sewers." It may be added that a Report drawn up in 1869, by a Committee of the Tweed Commissioners appointed to investigate the subject of pollutions shows that, in the four Border counties through which the Tweed flows, there were no fewer than ninety-three mills and manufactories, from most of which refuse of a more or less injurious character is discharged into the rivers. In Roxburghshire there were twenty-nine mills and manufactories, nine being in the Jedburgh district, three in the Kelso, and seventeen in the Hawick district. In Selkirkshire there were thirty-one, eight being in Selkirk, and twenty-three in the Galashiels district. In Berwickshire there were twenty-six, and in Peeblesshire seven. The Report specifies only eleven instances, or

about one in nine, in which tanks or other means of purification were used in these ninety-three mills and manufactories. These sources of pollution have now increased to at least a hundred, and they are yearly growing in number and magnitude.

Salmon Fishery Statistics.

The English Inspectors in their recent Reports estimate the value of the salmon fisheries of England and Wales to be at least 100,000*l.* a year, which is a most gratifying increase from the 30,000*l.* a year which they were supposed to be worth when these inspectors were originally appointed. The Tyne is the most productive river in England, in spite of the pollutions of Newcastle. In the year 1872 it yielded the remarkable number of 129,100 salmon. But since then, owing to the constant working of the destructive "Hang-nets" in the mouth of the river, the produce has very greatly decreased; so that, in 1874, it was only 21,746—a falling off of 107,354 fish. Each of these hang-nets is 140 yards long, and the fishermen occasionally pin 8 or 10 of them together, so that the conjoined net is nearly a mile in length. The inspectors, however, express a hope, now that a "playground" has been determined and sanctioned at the mouth of the river from which these nets are excluded, and the whole of the South Tyne has been opened up for the ascent of salmon, by the construction of an efficient pass in a dam that formerly shut up the river, that the fisheries of the Tyne will gradually be restored to their

former prosperity; and this hope seems to be justified by the fact that, in 1875, the yield of the Tyne had risen to 23,290 fish, or 1544 above the yield of the previous year. The best angling river in England is the Usk. In 1872 it yielded 3000 salmon to the net, and no fewer than 2000 to the rod. In 1873 a single rod on this river captured, in one day, 26 fish, weighing 280 lbs.

The protection of the salmon rivers in the different fishery districts in England is provided for in great measure by a scale of license duties on weirs, cruives, nets, rods, &c. The following table gives a summary of the number of net and rod-fishermen, and of the amount raised in license duties in England and Wales, in the years 1867–75:

Year.	Number of			Total Men.*	Revenue from			Total Revenue.
	Net Fishermen.	Rod Fishermen.	General Licenses.		Nets.	Rods.	General Licenses.	
					£	£	£	£
1867	3029	2350	39	5379	3851	1816	430	6097
1868	3913	2076	29	5989	4921	1593	530	6844
1869	3083	2030	24	5113	4826	1420	320	6566
1870	2977	1616	23	4593	4757	1240	269	6266
1871	3383	2054	26	5437	5370	1469	307	7146
1872	2907	2310	24	5217	4552	1589	312	6453
1873	2990	2579	20	5348	4650	2031	143	6824
1874	3045	2779	27	5824	4974	2196	211	7381
1875	2970	2605	24	5575	4715	2086	202	7003

* Exclusive of men employed by holders of "General Licenses."

In 1875 the revenue of the boards of conservators in thirty-nine fishing districts amounted to 9140*l.* 16*s.* 1*d.*,

and the expenditure to 9374*l.* 17*s.* 6½*d.* The largest revenues from licenses were raised in the following districts: Tyne (827*l.*); Ribble (641*l.*); Eden (612*l.* 17*s.*); Severn (476*l.* 5*s.*); Wye (508*l.*); and Usk (388*l.*).

The following tables give a summary of the number of water-bailiffs employed in the protection of the rivers, and of the number of prosecutions and convictions under the Salmon Fishery Acts.

Summary of the number of water-bailiffs employed in the Fishery districts of England and Wales, from 1871 to 1875:

	1871.	1872.	1873.	1874.	1875.
Permanent	102	101	112	107	117
Temporary	90	79	65	68	76
Total	192	180	177	175	193

Summary of the number of prosecutions and convictions under the Salmon Fishery Acts, from 1867 to 1875:

	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.
Prosecutions ..	260	413	381	408	432	318	266	361	336
Convictions ..	197	328	304	343	345	235	220	272	290

Ireland contains a great number of rivers subject to the supervision of the Irish Inspectors of Fisheries. Among these are many splendid salmon streams, the chief of which are: the Shannon, with a course of

upwards of 200 miles, a catchment basin of 4553 square miles, and 25 tributaries, all more or less frequented by salmon; the Erne, with a catchment basin of 1689 square miles, 14 tributaries, most of them possessing fine spawning grounds, and a magnificent system of lakes; the Nore, Suir, and Barrow, with a catchment basin of 3500 square miles, and so productive of salmon, that, in 1872, no less than 420 tons were shipped, by two lines of steamers at Waterford for the English markets; the Moy and the Ballisodare, both commercially productive and yielding good sport for the rod; the Galway river, which drains the wide expanse of Lough Corrib; the Lee and the Bush, both excellent angling rivers; the Cork Blackwater, also a capital angling stream, but being gradually destroyed by the drift and snap nets that harry its waters between Cappoquin and Youghall; the Ban and the Foyle.

In Ireland, as in England, license duties are levied for the protection of the fisheries. The table on pp. 256–7 shows the amount of license duties received by the various boards of conservators during the year 1875; the nature and number of the engines used, the number of men employed in salmon fishing, and many other useful details.

The gross annual value of the Irish salmon fisheries is very great, being estimated by Major Hayes, in his Report of 1874, at no less a sum than 400,000*l.* a year. "Having made careful inquiry," he says, "I have ascertained, on reliable authority, that the boxes of Irish salmon received in England each contain, upon

an average, 150 lbs. weight of fish. This would give a money value (estimating the price at a fraction under 1*s.* 1*d.* per pound (or 8*l.* per box) of 324,800*l.* It must be borne in mind too, that the 40,600 boxes of salmon traced to the principal markets in England by no means represent the actual quantity sent there, for we have been unable, as yet, to trace what has been forwarded to other towns, and the quantity is very considerable, besides what is consumed at home. From the foregoing, I am convinced that the gross money value of the Irish salmon fisheries very considerably exceeds the amount of 400,000*l.* per year, as estimated by this department, and shown in the Report for 1870."

It appeared to the Inspectors of Irish Fisheries, that it would be for the general interests of the salmon fisheries if Ireland were divided into three districts, each division being under the supervision of an inspector; and, accordingly, they, some years ago, portioned off the country into three divisions; the first, embracing that part of the coast and all the rivers flowing thereinto between Rossan Point, in the county Donegal, and Wicklow Head, in the county Wicklow; the second, that part of the coast, and all the rivers flowing thereinto between Wicklow Head and Dunmore Head, in the county Kerry; and the third, that part of the coast, and all the rivers flowing thereinto between Dunmore Head, in the county of Kerry, and Rossan Point, in the county Donegal.

Of these divisions, the most important is the third, which contains 145 rivers and tributary streams fre-

Number and Description of Licenses sold in 1875.																1. 1875. Amount of License Duty.			2. 1875. Percentage on Poor Law Valuation.		
1. Salmon Rods.	2. Cross Lines.	3. Snap Nets.	4. Draft Nets.	5. Drift Nets.	6. Trammel Nets, for Pollen.	7. Pole Nets.	8. Bag Nets.	9. Fly Nets.	10. Stake Nets.	11. Head Weirs.	12. Box, Crib, &c.	13. Gap, Eye, &c.	14. Sweepers.	15. Coghills	16. Loop Nets.	£	s.	d.	£	s.	d.
97	..	..	16	..	..	..	..	..	..	..	..	..	..	..	..	145	0	0	..		
89	..	..	56	..	..	..	..	..	..	..	..	..	..	..	..	257	0	0	..		
190	18	264	29	85	..	..	..	..	4	1	5	28	..	..	..	1168	0	0	..		
236	6	35	9	114	..	1	1	..	2	..	2	..	..	..	..	761	10	0	41	10	0
317	3	..	63	6	..	..	1	..	1	..	..	..	..	..	..	570	0	0	..		
7	..	..	17	..	..	..	..	..	..	..	..	..	..	..	..	58	0	0	..		
12	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	48	0	0	..		
17	..	..	7	..	..	..	1	..	..	..	..	..	5	..	..	52	10	0	7	16	8
121	4	..	66	..	..	..	..	..	..	..	2	..	..	..	..	347	0	0	..		
231	39	31	70	119	..	18	..	..	31	1	8	136	..	..	..	2081	5	0	..		
110	5	..	13	..	4	..	..	..	..	..	6	22	..	..	..	247	0	0	85	0	0
53	..	..	15	..	..	1	..	..	..	..	..	1	..	..	..	101	0	0	..		
29	..	..	20	..	..	..	10	..	..	..	..	..	..	..	..	189	0	0	..		
71	1	..	29	32	..	..	5	..	..	..	7	13	..	..	..	389	0	0	..		
20	..	..	16	..	..	..	1	..	..	..	..	6	..	..	..	84	0	0	..		
98	9	..	42	..	..	3	..	..	1	..	4	32	..	..	..	350	0	0	5	0	0
65	1	..	17	11	..	..	3	..	..	..	3	..	..	..	3	214	0	0	14	0	0
77	6	..	33	23	..	3	4	..	3	..	..	..	..	..	..	393	0	0	95	0	0
110	1	..	119	5	103	..	2	..	..	..	4	3	..	110	..	760	0	0	238	0	0
20	..	..	11	1	..	..	14	..	..	..	..	..	..	..	..	196	0	0	27	0	0
63	4	6	57	..	..	..	..	..	..	..	4	3	..	34	..	328	0	0	..		
34	..	..	27	1	..	..	2	..	..	1	..	11	..	..	..	155	0	0	9	10	0
2067	97	336	744	397	107	26	44	..	42	3	45	255	5	144	3	8894	5	0	522	16	8

The estimate of the average number of men

Salmon Rods	1 man.	Pole Nets	3 men.
Cross Lines	2 men.	Bag Nets	4 „
Snap Nets	4 „	Fly Nets	4 „
Draft Nets	6 „	Stake Nets	4 „
Drift Nets	5 „	Head Weirs	1 man.
Trammel Nets	2 „	Box, Crib, &c. (every five)	2 men.

3. 1875. Amount received for Fines, Sale of Forfeited Engines, Interest on Bank Account. *	4. 1875. Amount of Subscriptions received. *	5. 1875. Total Amount received.	6. 1875. Average Number employed.	Increase or Decrease between 1874 and 1875.*				District.
				Increase in Amount.	Decrease in Amount.	Increase in Number employed.	Decrease in Number employed.	
£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.			
..	..	145 0 0	193	..	5 0 0	..	5	1
33 5 0	1 6 8	291 11 8	425	38 16 8	..	19	..	2
83 7 4	..	1,251 7 4	1,956	70 17 4	..	45	..	3
100 8 0	..	903 8 0	1,028	125 18 0	..	66	..	4
61 15 1	..	631 15 1	739	124 15 1	..	84	..	5
1 10 0	..	59 10 0	109	0 10 0	..	..	1	6[1]
..	..	48 0 0	84	..	4 0 0	..	7	6[2]
18 5 10	..	78 12 6	93	6 2 6	..	..	16	6[3]
21 16 8	..	368 16 8	526	33 16 8	..	1	..	7
141 10 4	..	2,222 15 4	1,902	142 0 4	..	1	..	8
..	10 0 0	342 0 0	253	..	45 0 0	..	51	9
14 8 6	..	115 8 6	148	14 8 6	..	..	5	10[1]
6 18 0	..	195 18 0	189	1 18 0	..	4	..	10[2]
40 13 4	..	429 13 4	456	39 13 4	..	17	..	11
..	..	84 0 0	132	..	14 0 0	..	9	12
16 4 9	154 14 0	525 18 9	447	45 19 9	..	17	..	13
4 9 5	..	232 9 5	241	24 9 5	..	9	..	14
9 5 2	605 0 0	1,102 5 2	439	594 5 2	..	..	31	15[1]
77 5 5	..	1,075 5 5	1,183	173 5 5	..	162	..	15[2]
3 13 4	113 11 0	340 4 4	147	119 4 4	..	..	18	16
7 3 8	..	335 3 8	479	35 13 8	..	24	..	17[1]
3 6 11	2 0 0	169 16 11	232	6 16 11	..	14	..	17[2]
645 6 9	886 11 8	10,949 0 1	11,401	1598 11 1 †	68 0 0	463	143	

employed is made up as follows:

Gap, Eye, &c. .. .. .. 2 men.	Coghills .. .. 1 man.
Sweepers .. .. 6 „	Loop or Frame Nets .. 1 „

* It should be observed that two additional columns, Nos. 3 and 4, have been introduced for the first time, thereby affecting the apparent increase or decrease considerably

† Actual increase in License duty in 1875 over 1874—£118

quented by salmon, extending to a length of 2538 miles, and watched by upwards of 800 water-bailiffs, employed by boards of conservators and private individuals. In this division is the Limerick district, containing the great river Shannon, where the commercial value of the fisheries is very considerable, and where the angling, especially in the famous Castleconnell waters, is first-rate. A great number of fish are taken by the nets near the tidal waters, and the average size as well as the number of these fish is very remarkable, reaching 18 lbs. in 1873, whilst numbers were taken in the same year from 40 to 46 lbs. In 1875 the average weight of the spring fish was about 22 lbs.; and, in the same year, the amount of license duty collected in the Limerick district was 2081*l.* 5*s.* Most of the salmon captured in the district are exported, a few spring fish only being reserved for home consumption.

Another valuable district in this division is the Galway district, comprising the famous Corrib or Galway river, and the extensive waters of Ballynahuish. The Moy, Ballisodare, and Sligo rivers are likewise contained in this division. The last named is remarkable as being one of the very earliest of Irish salmon rivers, salmon in splendid condition—according to the testimony of the Inspectors—being found in the estuary in winter. The fisheries on the Erne are likewise of much importance — a valuable commercial fishery existing in the lower waters, while the upper afford some of the best salmon angling in Ireland.

In the second division, the most important rivers are the Laune, flowing from the Lakes of Killarney; the Waterville, of which Major Hays tells us, that "it may be said that salmon in prime condition may be had in this river on almost every day in the year;" the Lee, on which a private association—the Cork Anglers' Club—have done a great deal for the improvement and preservation of the river; and the Blackwater, which falls into the sea at Youghal, which contributes annually large quantities of salmon to the English markets, and which would yield much larger quantities, if its spawning tributaries were efficiently protected, instead of being scarcely watched at all. It is remarkable that the salmon angling in this river—extending from Lismore up to and beyond Mallow—is so good as it is, considering that about 500 net fishermen are constantly engaged during the open season in netting the mouth of the stream between Cappoquin and Youghal, and that scarcely anything is done by the proprietors for the protection of the rod-fishing, beyond paying for their angling licenses. The fish on the Blackwater are of a large average weight. I have myself caught a good many salmon with fly over 20 lbs., and one of 33 lbs., between Fermoy and Lismore; and a fish of 43 lbs. was taken by the rod, on a short stretch of water, a little above Fermoy, a year or two ago.

The most important commercial fisheries in this division are those in the Waterford district, which contains the great rivers Suir, Nore, and Barrow, whose united streams fall into the sea at Waterford. Most of

the salmon from this division are exported to England. The angling on the Suir is excellent, and much has been done to extend and develop the resources of the river by the Suir Preservation Society, which has not only aided in protecting the river and its tributaries, but also, in 1870, raised funds for the erection of salmon ladders on two weirs above Cahir, which were formerly serious obstructions, but over which salmon can now pass freely.

The remaining, or northern, division of Ireland is the least important of the three, either for the purposes of commerce or of sport. It extends from Wicklow Head on the east to Rossan Point on the west. Several districts in this division suffer greatly from impassable weirs and from lint-pollutions. The Boyne, in the Drogheda district, is one of the principal rivers. The salmon in it have greatly increased in size within the last twelve years. Fish exceeding 20 lbs. were rarely captured twelve years ago; now, the average is nearly 18 lbs. A number between 30 and 40 lbs. were taken in 1872, a few between 40 and 50 lbs., and one of 54 lbs. The chief takes are in the tidal waters by draft-nets. The Bann, which drains Lough Neagh, the largest lake in the United Kingdom, is another great river in this division. An angling club rents a large portion of the river below Lough Neagh, and does much for its preservation. Some of the navigation weirs are said to require more efficient fish-passes. The Bush, owned altogether by one proprietor, is the best angling river in this division.

The following is a summary of the number of boxes

of salmon exported to England, consigned from the Irish Fisheries, in 1875:

	No. of Boxes of 150 lbs. each.
London	5,745
Nottingham	2,911
Bradford	2,805
Manchester	7,552
Sheffield	3,409
Wolverhampton	2,311
Leeds	3,676
Liverpool	8,888½
Birmingham	6,977
Total, 1875	44,274½
„ 1874	43,638½
Increase	636

The mainland of Scotland and the Hebrides abound in salmon rivers; about 150 being enumerated in the bye-laws of the Scotch Commissioners fixing districts, estuaries, and close times, which form part of the general Acts of 1862 and 1868. In Scotland, the protection of the salmon fisheries, and the enforcing of the provisions of the statutes relating to them, is entrusted to district boards, whose functions are very much the same as those of English boards of conservators, though there are considerable differences in their constitution and mode of election. Unfortunately, two-thirds of the salmon fishing districts in Scotland are without district boards, and have consequently no official body whose special duty it is to preserve the fisheries and prevent poaching, which inevitably leads to much more frequent infringements of the law in these districts than in those where an efficient supervision is exercised by a regularly organized body of

salmon fishery proprietors in terms of the Acts of 1862 and 1868. There are no license duties in Scotland upon nets, rods, and other instruments used in salmon fishing; but the protection of the fisheries is provided for, in those districts where district boards have been constituted, by an annual assessment proportioned to the value of the fisheries. This varies from 4 to 20 per cent.; and on the Border river—the Tweed—there is a statutory assessment of 20 per cent. and a voluntary assessment of 7 per cent. The Scotch Commissioners are not empowered to make annual inspections and reports on the state of the salmon fisheries, as the Inspectors in England and Ireland are in their respective countries; so that it is impossible to ascertain the statistics of the Scotch salmon fisheries as fully and regularly as those of the sister countries. A great deal of information regarding them, down to the year 1870, will, however, be found in the Report and Appendix drawn up and published in 1871 by the Special Commissioners on the effects of recent legislation on the salmon fisheries in Scotland.

At present, the largest salmon rental of any river in the United Kingdom is that yielded by the river Tay, which, in 1874–5, was 18,941*l.* 13*s.* 4*d.*; in 1875–6, 21,634*l.* 4*s.* 4*d.*; and in 1876–7, 20,381*l.* 18*s.* 4*d.* In 1852 the rental of the Tay, owing to the injurious effects of the Salmon Fishery Act of 1828, which permitted the netting to continue until the middle of September, had fallen to only 7973*l.* 5*s.* The proprietors then, seeing the fatal results of this extension of the fishing season, voluntarily agreed to return to what had been the commencement of the close time for 400

years before the passing of the Act of 1828, namely, the 27th of August. The good effects of this change were almost immediately apparent; and, in 1861, the rental had risen to 14,109*l.* 15*s.* 7*d.* By the Act of 1862 the close time for the Tay was fixed from 21st August to 4th February; under this system of a reduction of the netting season, combined with the artificial breeding of salmon, commenced at Stormontfield ponds in 1852, the rental of the river has shown a steady and satisfactory increase.

The Tay has its source in the skirts of Ben Lui, in Argyleshire, from whence it flows through a long stretch of lochs and mountains receiving the tributary waters of the Lyon, Isla, Tummel, Garry, and many other smaller streams, till its ample current sweeps past the fair city of Perth and falls into the German Ocean, after draining 2500 square miles of country. The salmon of the Tay are remarkable alike for their number, quality, and size. The nets on the lower waters are worked so effectively and continuously during the open season, that the upper proprietors have scarcely any angling, and, in fact, there is no rod-fishing worth mentioning, except in Loch Tay, until after the nets are removed on the 20th August. But from that time until the 10th October, when the rod-fishing closes, there is often excellent angling. In 1873, one angler secured in a single day thirteen salmon, weighing 320 lbs., and another fifteen fish, weighing 257 lbs.; the last five caught averaging 25 lbs., or 125 lbs. altogether. At page 6 of the Appendix to the Report of 1871 on the Scotch Salmon Fisheries, the number of fish annually caught on the

Tay is given by one witness at 100,300, and by another at 86,000. But, as the rental of the Tay is now about 4000*l.* a year larger than at the time when that evidence was given, the number of fish caught must be very considerably above these estimates.

Any account of the Tay would be incomplete without some notice of Loch Tay, in which the number of large clean salmon annually caught in the early months of the season is remarkable. These fish ascend the Tay in December and January, before the netting commences, so that in February the loch is well stocked with salmon. Loch Tay is about 16 miles long and 1 mile broad, and is in some places 600 feet deep. The salmon are caught by trolling with large-sized phantom minnows. They have been taken 48 lbs. in weight, and their average is 21 lbs. There are good inns both at the Killin and Kenmore ends of the lake, and a smaller one at Lawers. The following table will be found interesting.

LOCH TAY SALMON FISHING—1870 TO 1876.

Year.	Number of Salmon killed.	Aggregate Weight.	Average Weight.	Sum drawn for Fishing.
		lbs.	lbs. ozs.	£ s. d.
1870	460	9,118	19 13	435 0 0
1871	114	2,270	19 14	867 15 6
1872	293	5,972	20 6	637 5 0
1873	779	17,770	22 13	684 9 6
1874	253	5,295	20 15	962 17 6
1875	903	20,106	22 2	1,148 8 0
1876	476	9,786	20 10	1,248 0 0
Average	468	10,045	21 7	854 16 6

The Tweed appears at one time to have been—although it has long ceased to be—a more productive river than even the Tay. The most productive year of which any record exists was 1816. In that year 54,041 salmon, 120,594 grilse, and 67,074 trout, or 236,709 fish, were taken. But upwards of 208,000 fish were taken in 1820, and a take of 150,000 was not uncommon. Upwards of 58,000 salmon (excluding grilse) were taken in 1814 alone; an amount which exceeds the aggregate take in any five consecutive years since 1846. Again, the take of grilse in 1816 exceeds the take of the eight years, 1867 to 1874. Even at an earlier period the take of salmon on the Tweed seems to have been far in excess of what it is at present, as we find from a letter in the 'Edinburgh Magazine' of April, 1788. The writer of that letter states the rental of the Tweed fishings for 14 miles from the mouth of the river at upwards of 5400*l.*, and the expenses of fishing at about 5000*l.*, and calculates that to pay these sums, the fishings must have produced 208,000 salmon annually, exclusive of grilse and trout. The highest rental of which we have any record was in 1816, when the fisheries were assessed at 13,705*l.* 6*s.* 3*d.*

In spite of the many excellent provisions in the Tweed Fisheries Acts of 1857 and 1859, and the 27 per cent. of statutory and voluntary assessments on the fisheries which is devoted to the protection of the river, there has been a terrible falling off in the annual crop of salmon since these days. In the five years which commenced in 1854 and which were concluded in 1858, during which the effects of the legis-

lation of 1857 could not have been felt, the average annual take on the Tweed amounted to 10,520 salmon, 26,965 grilse, and 31,976 trout. During the five succeeding years, 1859–1863, the take was reduced to 9222 salmon, 20,118 grilse, and 26,895 trout. During the next period of five years, viz. from 1864 to 1868, the salmon again declined, while the trout increased, the numbers being 9141 salmon, 18,549 grilse, and 35,518 trout; while the period of six years, from 1869 to 1874, was marked by a further decrease, the average annual take being reduced to 10,532 salmon, 15,456 grilse, and 28,841 trout. In other words, the gross annual take of the first of these four periods amounted to 69,461; in the last it was reduced to only 54,829 fish. An unfavourable symptom in the Tweed fishings is the immense increase during recent years in the number of bull-trout and salmon trout. From 1807 to 1818, more than three salmon and grilse were caught, on an average, for every trout: from 1819 to 1863, the average take of salmon and grilse always exceeded, and usually largely exceeded, the take of trout; while, from 1864 to 1873, the average take of trout exceeded that of salmon and grilse put together. The price given for trout, however, has very greatly increased; as it appears from a table in the Appendix to the Report of 1875 on the operation of the Tweed Fisheries Acts, that the price of salmon was lower in 1874 than in 1855; that the price of grilse had only increased from 10½*d.* to 11⅝*d.* per lb.; whilst the price of trout had risen from 8⅞*d.* to 1*s.* 1⅛*d.* This rise in the price of trout is due to the opening of the Paris

market; the French, singularly enough, preferring trout to salmon, and actually paying higher sums for the former than the latter.

This great falling off in the produce of the Tweed since the early years of the present century is imputed by the Special Commissioners, in their Report of 1875, 1st, to the effects of the improved system of land drainage; 2nd, to pollutions; and 3rd, to poaching.

The angling on the Tweed * in autumn is first-rate, and larger rents are now paid for some of the best angling waters than are given on any other river in the United Kingdom. How rapidly their value has risen may be judged of by the fact, that the assessable value of the angling waters rose in the first five years after the passing of the Tweed Fisheries Acts from 898*l.* to 1857*l.* a year; and it is now further increased to upwards of 4000*l.* The angling season on the Tweed is a very protracted one, lasting from the middle of September to the 30th November. In 1873 a single rod captured, in one day, thirteen salmon, ranging from 18 lbs. to 35 lbs., and weighing in the aggregate 332 lbs. The largest salmon caught on the Tweed that year by rod and line weighed 53 lbs. In his 'Angler's Rambles,' that veteran fisherman, Mr. T. T. Stoddart, records that, on one occasion, the Duke of Roxburgh, in Maxwheel Pool, below Kelso Bridge, hooked, played, and landed twenty-eight salmon and grilse out of twenty-nine offers, a pisca-

* See Report by Messrs. Walpole and Young, the Special Commissioners appointed to inquire into the operation of the Tweed Fisheries Acts, pp. 8, *et seq.*

torial achievement probably unprecedented. The rental of the Tweed for 1875 was 12,173*l.* 5*s.* 8*d.*; and for 1876, 12,287*l.* 5*s.*

The salmon fishings in the river Forth and district at present produce a rental of 3500*l.* a year, and give employment to upwards of 150 net fishermen. Ten years ago the rental was only 2500*l.* The Forth itself is a somewhat sluggish stream; but its chief tributary, the Teith—on which are the principal angling waters in the district—is a clear, rapid river, with plenty of fine gravelly spawning grounds, and is much preferred to the main stream by salmon and sea-trout ascending from the sea. The two head waters which unite at Callander to form the Teith flow through some of the most beautiful and varied scenery in Scotland; the one rising in the Braes of Balquhidder, traversing Lochs Doine, Voil and Lubnaig, and the romantic pass of Leny; and the other having its source in Glengyle, and thence flowing through the picturesque scenery of the Trosachs, and Lochs Katrine, Achray, and Venachar. At the outlet of the last-named loch, there is a terrible obstruction to the free ascent of salmon to the valuable spawning grounds above in the shape of the dam and sluices erected by the Glasgow Waterworks Commissioners. The Forth District Board have made many efforts, but hitherto without success, to have these works made easily passable for salmon. Besides this obstruction, there are two cruives and nine dams on the Forth and its tributaries. At and below Stirling, the Forth is very much polluted by town sewage and paraffin refuse,

which the district board, as the law at present stands, are powerless to remove. The assessment for the protection of the Forth is about 20 per cent. on the fishery rental.

The North Esk, which rises in the Grampian mountains, and falls into the sea a little to the north of the town of Montrose, is, for its size, the most productive salmon river in Scotland. It has a drainage area of only 288 square miles, and the length of its course is 24 miles, yet the number of salmon annually caught in the river and district is from 25,000 to 30,000. The assessment is 7 per cent. on the fishery rental, and the river is watched by twelve water-bailiffs in close time and by four in the fishing season. Until the nets are off, there is scarcely any angling in the upper waters; but from 1st September to 31st October the rod-fishing is excellent, a good many salmon being killed every season from 25 lbs. to 40 lbs. weight. There are five dams on the North Esk, but all of them are easily passable for salmon, except that at Craigo, which has lately been greatly altered for the better, but is still susceptible of further improvement.

The South Esk, which falls into the sea at Montrose, is naturally a river admirably suited for salmon, and between Brechin and the sea there is many a stretch of gravelly stream and many a deep pool, such as salmon love to rest in. But the pollutions poured into it by the manufactories at Brechin have very much destroyed the river. The rental, however, shows a considerable rise within the last ten years. In 1867 it was only 1121*l.*; whilst in 1876 it was 1695*l.* 11*s.* 5*d.*

There are ten weirs on the South Esk—the worst and most obstructive being the West Mill weir at Brechin, which imperatively calls for improvement.

The Dee and Don, whose mouths are within 2 miles of each other, the former to the south and the latter to the north of Aberdeen, are both salmon-producing rivers; but the Dee is much the more valuable of the two, partly from its longer course and greater extent of spawning ground, and partly because the Don is very much obstructed near its mouth by the cruives a little above the old bridge of Balgownie, and by at least ten weirs at various points of its course above these cruives; whereas on the Dee there are no serious obstructions to the ascent of the fish. The Dee has the highest source of any river in the United Kingdom, rising from the Wells of Dee, amidst wild and grand scenery, 4060 feet above the sea, and not far from the summit of Ben Macdhui, the second loftiest mountain in Scotland. It has a course of about 90 miles, and is remarkable for the limpid purity of its waters and the perennial flow of its head springs. It affords first-rate angling, both in spring and autumn, from a little above Aberdeen almost to the Linn of Dee. The fishery assessment on the Dee is about 11 per cent., and yields upwards of 400*l.* a year for the purposes of protection. The Don, as compared with the Dee, is a somewhat dark-coloured sluggish stream. It has a course of 60 miles, and in its upper portions, owing to the obstructions already mentioned, there may be said to be no productive salmon fisheries, the valuable fisheries, those of Nether Don and the cruive fishings,

being at and near the mouth of the river. About 205 men are employed in net-fishing in the district of the Dee and Don. The assessable rental of the Dee is 8897*l.* 12*s.* 10*d.*; and of the Don, 3361*l.* 0*s.* 8*d.*

As there is little more than two miles between the mouths of these rivers, it seems clear that no fixed machinery for the capture of salmon should be allowed to be placed and worked within this two miles space; yet there are several stake-nets constantly at work, during the fishing season, on the narrow strip of sandy shore that separates the two streams, to the very great detriment of the fisheries in both rivers.

The Ythan joins the sea at Newburgh, about 12 miles north of Aberdeen. The sea-trout fishing in the estuary is very good. The best angling months are March, April, and May, and, in autumn, September. The finest spawning grounds are about 6 miles above Newburgh, in the vicinity of Ellon. The present assessable rental of the salmon fisheries in the river and district is 643*l.* Thirty-five men are engaged in net-fishing.

The small river Ugie is formed by the North and South Ugies, which, uniting at Longside, sweep past the picturesque old castles of Ravenscraig and Inverugie, and falls into the sea near Peterhead. About 4500 salmon and grilse are annually caught in the district of the Ugie.

The Deveron drains 472 square miles of country, and falls into the sea at Banff. Its mouth is extremely narrow and shallow; and as bag-nets are permitted within 400 yards on either side, and as Lord Fife's

cruives, which are only a short distance above the mouth, intercept the majority of the ascending fish, the upper proprietors get a very insignificant share of salmon until the nets and cruives are removed. After that, the angling is better. The average annual capture of fish by the rod, on the Deveron, is about 300. In 1862, a year when there were heavy floods, it was 500. There are twenty upper proprietors; so that 300 salmon would be 15, and 500, 20 to each annually. The present valuation of the Deveron fisheries is between 2000*l.* and 3000*l.* a year. The river is watched by fourteen water-bailiffs in close time, and three in the open season.

The Spey is the most rapid of the great rivers of Scotland. It drains upwards of 1000 square miles of country, and has a course of 120 miles. It ranks high as a salmon stream—the net-fishings being most productive, and the angling excellent. It does not suffer, like many of the Scotch rivers, from stake or bag nets being placed too close to its mouth, as the nearest fixed net, on the east, is 2 miles distant from the river's mouth, and the nearest on the west, 5 miles. There is nothing, therefore, to interfere with the free access of the salmon, whenever their instincts impel them to make for the fresh water. By far the most valuable salmon fishings on the Spey belong to the Duke of Richmond, who keeps them in his own hands. In 1870 the assessment on the fishery rental, for the protection of the river, yielded 843*l.*—the assessment being somewhat under 10 per cent. At that time there was a superintendent and forty-five water-bailiffs to watch the river in close time. The number of men

employed in net-fishing, in the district, is 163. The Spey occasionally suffers from a peculiar species of pollution, caused by the pouring in of dirty water, from dams formed on its tributaries, for the purpose of floating wood down. This water, though it cannot, perhaps, be shown to be poisonous to the fish, has, at all events, the effect of sickening them, so that they will not rise to the fly for a day or two after it enters the main stream. As a proof of the excellence of the Spey as an angling river, it may be mentioned that, during the season of 1873, one rod captured 300 salmon and grilse, whose united weight was upwards of a ton. The gross annual value of the salmon taken in the river and district of the Spey is probably considerably understated at 25,000*l.* a year. The following table of the produce of the Duke of Richmond's fisheries, handed in by his Grace, in 1860, to a select Committee of the House of Lords, appointed to inquire into the Scotch Salmon Fisheries, will give some idea of the great productiveness of the noble river.

DUKE OF RICHMOND'S FISHINGS IN SPEY.

Year.	Salmon.	Grilse.	Trout.	Total.
1851	6,515	33,285	8,660	48,460
1852	10,980	46,041	8,549	65,570
1853	15,772	58,166	16,675	90,613
1854	29,780	36,148	16,025	81,953
1855	13,194	48,740	9,660	71,594
1856	14,103	27,528	8,118	49,749
1857	13,466	54,949	31,473	99,888
1858	30,840	35,409	15,313	81,562
1859	23,608	17,263	5,853	46,724

The Findhorn rises in a wild district among the Monadliad mountains. But its lower course is richly wooded; and, at Glenferness and Relugas, it flows through scenery of exquisite beauty. It falls into the sea, after a course of 60 miles, near the town of Forres. The lower waters between Sluie pool and the sea are severely netted, and Bessy Bay, not far from the river's mouth, literally bristles with a combination of stake and bag nets, ranged, line beyond line, all along the curve of the bay. As might be expected, under these circumstances, the lower proprietors engross the lion's share of the fisheries. In 1870, one witness stated to the Special Commissioners, that one salmon for every two miles of river was about the average angling-take during the netting season; yet, an old keeper, who had fished on the Findhorn for thirty-three years, said, that he remembered twenty-five years before, killing ten salmon in a morning, above Dulsie Bridge, whereas now he could not kill as many in a year. The angling, however, is said to have somewhat improved since 1870. The assessment for the purposes of protection in the Findhorn district is 10 per cent. The fishings at the long pool at Sluie were once very productive. According to the Statistical Account of Scotland, it is stated to be on record, in a letter from the Earl of Moray to his Countess, that in 1648 no fewer than 1300 salmon were netted in one night, 520 being taken at a single draught. If the wider estuary line recommended for the Findhorn by the Barons of Exchequer, in 1778, were adopted, instead of the present more restricted one, the river fishings would probably be very much improved in the course of a few years. The

sea fisheries, in the Findhorn district, have a rental of about 3270*l.*, and give employment to seventy men.

The following carefully prepared tables, drawn up by the lessee of the fishings (see pp. 276,277), show that in these sea fishings in the Findhorn district, there has been a considerable decrease in the seven years after the passing of the Salmon Act of 1862.

The Nairn, or Water of Alders, rises at Cairn Gregor, in the Monadliad mountains, and, after a course of 36 miles, enters the sea at the town of Nairn. It is only a third-class stream in point of size, but is frequented by both salmon and sea-trout. Mr. Stoddart, in his 'Anglers' Rambles,' mentions killing upwards of ten dozen of the latter species of fish in February and March, 1837. Near the mouth of the Nairn there is a bad obstruction, called Nairn Mills Weir, with a very imperfect and useless salmon ladder. The existing bye-law permits fixed nets within 400 yards of the mouth of the Nairn. This distance should be extended to half a mile. The assessable rental of the fishings is 331*l.*

The Ness flows in a broad full stream out of Loch Ness, and enters the sea, after a course of nearly 8 miles, a little below the town of Inverness. It is an early and fertile salmon river. The assessable rental of the fishings for 1876-77 is 3069*l.* 11*s.* During close time, the district board employs one inspector and five water-bailiffs for the protection of the river.

The Beauly, which belongs to Lord Lovat and The Chisholm, is another splendid salmon river, and some angling exploits have been performed on it, which have never been equalled elsewhere in Scotland, and which

FINDHORN DISTRICT.

STATEMENT of SALMON and GRILSE caught on BURGHEAD and ROSEISLE FISHINGS, from 1856 to 1862, as undernoted

Year.	Boxes.	Salmon.	Grilse.	Lbs. Weight. Total.	Brls. Lbs.	Tons. Cwt.	Average Price per lb. Salmon and Grilse, throughout the Season.
1856	192 containing	1,644	2,276 =	29,850 =	68 202 or	13 6	11¼*d.*
1857	221 „	1,964	3,007 =	34,390 =	78 382 „	15 7	9½*d.*
1858	267 „	2,789	2,267 =	36,912 =	84 288 „	16 9	8⅝*d.*
1859	335 „	2,295	2,786 =	34,324 =	78 316 „	15 6	10*d.*
1860	195 „	1,825	1,925 =	26,842 =	61 246 „	12 0	11⅝*d.*
1861	174 „	1,302	2,094 =	24,286 =	55 306 „	10 16	1*s.* 0¾*d.*
1862	295 „	2,169	4,307 =	44,777 =	102 305 „	19 19	11¼*d.*
7	1679 „	13,988	18,662 =	231,381 =	530 301 „	103 3	6*s.* 3½*d.* Total for seven years.
Yearly average	239⅞ „	1,998⅞	2,666 =	33,054⅜ =	75 354 „	14 14	10⅝*d.* per lb. average yearly.

From 1863 to 1869, as undernoted.

1863	309	containing	2,593	2,621	= 42,149	= 96 293	or 18 16	11¼*d.*	
1864	207	„	1,657	3,146	= 31,345	= 71 389	„ 13 19	11½*d.*	
1865	184	„	1,932	1,581	= 27,520	= 63 52	„ 12 5	1*s.* 1¾*d.*	
1866	170	„	1,062	2,690	= 23,872	= 54 328	„ 10 13	11¾*d.*	
1867	149	„	1,357	1,586	= 22,056	= 50 255	„ 9 17	1*s.* 1¾*d.*	
1868	234	„	3,054	921	= 37,791	= 86 295	„ 16 17	1*s.* 3¼*d.*	
1869	124	„	1,135	1,541	= 19,927	= 45 307	„ 8 18	1*s.* 1*d.*	
7	1377	„	12,790	14,086	=204,660	=469 175	„ 91 5	7*s.* 6¼*d.*	Total for seven years.
Yearly average	196⅐	„	1,827⅐	2,012⅔	= 29,237⅐	= 67 25	„ 13 0⅝	1*s.* 0⅝*d.*	per lb. average yearly.

	Boxes.	Salmon.	Grilse.	Lbs. Weight. Total.	Brls. Lbs.	Tons. Cwt.		
From the year 1856 to 1862 there were	1679	13,988	18,662	= 231,381	= 530 301	or 103 3	10⅜*d.*	average Salmon and Grilse, per lb.
From the year 1863 to 1869 there were	1377	12,790	14,086	= 204,660	= 469 175	„ 91 5	1*s.* 0⅝*d.*	ditto ditto
Being a decrease, since the Salmon Fisheries Act of 1862, on seven years of ..	302	1,198	4,576	= 26,721	= 61 126	„ 11 18	Increase of 2*d.* per lb.	
And an average yearly decrease of about	43	171	653	= 3,817	= 8 329	„ 1 14	and an average yearly increase of 2*d.* per lb.	

may vie with the most remarkable reported in Norway and Canada, as the following table will show:

SALMON AND GRILSE KILLED IN THE BEAULY BY ONE ROD.

1854. Lord Lovat.		1859. Colonel Duff.		1864. Lord Lovat.	
June 20	16	July 1	21	June 27	27
„ 26	19	„ 2	17	„ 28	24
„ 27	19	„ 3	19	„ 30	32
„ 28	14	„ 4	19	July 4	33
„ 29	20	„ 5	14	„ 5	30
„ 30	14	„ 7	16		
July 3	11				
„ 6	15				
	128		106		146

These great angling feats have been, however, surpassed on some of the Canadian rivers. Thus, on the river Godbout, Napoleon A. Comeau (River Guardian) killed the following number and weight of fish in July, 1874:

Date.	Fish.	Weight.	Date.	Fish.	Weight.
		lbs.			lbs.
July 8	7	80	Forward	312	3359
„ 9	57	634	July 21	13	124
„ 10	25	282	„ 22	20	198
„ 11	34	361	„ 23	6	63
„ 13	40	438	„ 24	3	30
„ 14	25	253	„ 27	3	33
„ 15	16	172	„ 28	2	19
„ 16	37	394	„ 31	1	28
„ 17	16	186		360	3854
„ 18	28	286			
„ 20	27	273	Grilse	5	19
Forward	312	3359		365	3853

THE BEAULY FISHINGS.

STATEMENT of SEVEN YEARS' AVERAGE TAKE of FISH, and RENTS.

1st. From 1809 to 1815.
2nd. „ 1856 „ 1862.
3rd. „ 1863 „ 1869.

Season.	Take.			Rent.			Average Take.			Average Rents.		
	Salmon.	Grilse.	Trout.	£	s.	d.	Salmon.	Grilse.	Trout.	£	s.	d.
1809	5,543	2,369	201	1300	0	0						
1810	3,908	2,412	295	1300	0	0						
1811	3,548	2,482	241	1300	0	0						
1812	2,642	6,674	224	1300	0	0						
1813	2,682	6,442	..	1300	0	0						
1814	2,100	9,000	..	1300	0	0						
1815	2,240	9,300	..	1300	0	0						
Totals	22,663	38,679	..	9100	0	0	3237	5525	..	1300	0	0
1856	859	2,838	312	429	15	8						
1857	710	4,813	489	365	17	10						
1858	1,335	3,880	783	422	11	1						
1859	1,807	4,639	240	699	1	4						
1860	1,089	2,183	139	385	12	5						
1861	215	2,322	10	151	18	9						
1862	638	2,376	17	289	17	11						
Totals	6,653	23,051	1990	2744	15	0	950	3293	284	392	2	1
1863	1,190	4,046	310	501	10	8						
1864	1,544	7,400	117	996	18	9						
1865	1,442	3,402	119	822	9	10						
1866	1,510	5,698	340	1012	13	8						
1867	1,069	4,745	181	815	5	7						
1868	1,650	1,269	292	709	18	11						
1869	727	3,267	1092	523	0	2						
Totals	9,132	29,827	2451	5381	17	7	1304	4261	350	768	16	9

There is a cruive dike, not far from the mouth of the Beauly; the pool below which is the most productive on the river. The previous tables will show that the Beauly fishings were formerly more productive than at present, and that they have begun to improve since the passing of the Act of 1862, under which the estuary of the Beauly was extended, and the fixed nets removed from Chanonry Point.

The Conon drains more than 400 square miles, and flows through a number of beautiful lakes. Its head waters are the Fannich and Sheen, the former issuing from Loch Fannich, and the latter from Loch Roshk. The chief tributaries are the Meag, Rasay, and Orrin. The Falls of the Conon form an insurmountable barrier to the passage of salmon to many miles of splendid spawning ground. The Falls of Rogie, on the Rasay or Blackwater, are not absolutely impassable, but they form a considerable obstacle to the free ascent of salmon, and might be easily improved. The Falls on the Orrin completely prevent the upward progress of salmon, being 15 feet high, and quite perpendicular. But, when I inspected them in 1870, I found that the pool above the fall was from 11 to 13 feet deep, and that there was only a wall of hard rock, about 6 feet in thickness, between the pool above and the pool below. It is obvious, therefore, that it would be neither very difficult, nor very expensive, to reduce the rock by blasting, to such a height as would admit of the ascent of salmon. The worst obstacle on the Conon is the artificial obstruction caused by the cruive dike at Brahan, not far from the mouth of the river; and, considering the great and annually increasing

value of salmon angling, the upper proprietors would probably find it well worth their while to buy up and remove these cruives.

It is a moderate estimate to reckon the value of the salmon caught in the fifteen rivers above enumerated, in regular order, from the Forth to the Conon, at 120,000*l.* a year, and the number of men employed in net-fishing, and in watching the rivers, at 2000. The Tweed is not included in this estimate, as some of its fishings are in England. The gross yearly value of the salmon caught, in the districts of the Tay and Spey alone, cannot be much under 70,000*l.*

Proceeding northwards from the Conon, we arrive at the rivers of the Dornoch Firth. The united waters of four salmon streams—the Shin, Oykel, Carron, and Cassley—flow beneath Bonar Bridge into the head of the Dornoch Firth. The netting in the estuary below the bridge is worth more than 1000*l.* a year, and the angling in the upper waters—particularly in the Shin and Oykel—is capital. It is alleged that the channel of the river below Bonar Bridge has been artificially and illegally altered and narrowed, so as to give undue facilities for netting, and thus injure the angling in the upper waters; and an action at law, which will decide the question, is now in dependence between the Duke of Sutherland and Sir Charles Ross. The valued rental of the fishings in the Kyle of Sutherland fishing district, which includes the four rivers above mentioned, is 2345*l.* 10*s.* The innkeeper at Oykel Bridge Inn has 5 miles of the river, which he lets out by the day, week, or month, as may be agreed upon. The Shin, which drains the spacious

basin of Loch Shin, has a course of between 6 and 7 miles from its parent lake to the sea. It is one of the finest angling rivers in Scotland. March, April, and May, are the chief months for salmon, and June and July for grilse.

We next come to the Brora and Helmsdale, two excellent and early salmon rivers. The angling in both is very good. In the Brora the fish do not ascend beyond the Fall pool, above Loch Brora, until the last months of summer and beginning of autumn, when they pass the Fall, and then there is good angling in the upper pools some distance above the old fort called Castle Coll. If anyone wishes to see what obstacles salmon are capable of surmounting, let him walk through the romantic rocky gorge between the Fall pool and the upper Brora. I have repeatedly taken several salmon in a day in these upper waters in autumn, and can therefore vouch for their passing the long series of precipitous falls in the gorge below.

In Caithness-shire, the Thurso—the earliest, and, perhaps, the best angling stream in Scotland—is the only salmon river deserving notice; the productiveness of the Buriedale being impaired by a gravel bar at the mouth, and the Wick river being destroyed by various kinds of pollutions. The Thurso is 40 miles long, and has a catchment basin of 162 square miles. It opens for angling on the 11th January. It belongs to a single proprietor, and is leased by Mr. Dunbar, Brawl Castle, who has been most assiduous and successful in developing the angling capabilities of the river, so as to afford the utmost amount of sport to the eight rods to whom he lets it out. As many as 1800

salmon have been killed by the rod on the Thurso in a single season. The following returns, kindly furnished by Mr. Dunbar, give the number and weight of the fish killed on the Thurso, by the rod, from 1st February to 1st June, for the last five years:

Year.	Salmon.	Weight.
1872	748	8,693
1873	698	7,982
1874	1237	14,736
1875	647	7,263
1876	543	6,572

Mr. Dunbar adds that, after the 1st June, the fishing in the Thurso is let along with the shootings, and it is difficult to ascertain the number of fish killed in the summer and autumn months. In a wet season, when there are floods to take up the fish, the sport is sometimes very good; whilst in a dry season it is very poor. But, on the whole, he thinks that the number of salmon and grilse killed in these latter months will average about a half of the number killed from 1st February to 1st June.

Of the seven salmon rivers of Sutherlandshire that fall into the Pentland Firth, the Naver is much the largest and the best; it is a very early stream, and affords splendid angling. As many as forty salmon have been taken from its waters by a single rod in a fortnight. The Grudie or Dionard, which falls into the Kyles of Durness, also, occasionally, affords excellent sport. Some years ago the lessee of the river captured twenty-four fish in one day.

On the next page is a return of the weight of fish

RETURN (IN LBS.) of FISH CAUGHT from 1864 to 1876 in the DUKE of SUTHERLAND'S FISHERIES.

Year.	River Halladale.		River Strathy.		River Naver		River Borgie.		River Hope.		River Helmsdale.		River Brora.		Total.	
	Salmon	Grilse.	Salmon.	Grilse.	Salmon.	Grilse.	Salmon.	Grilse.	Salmon.	Grilse.	Salmon.	Grilse.	Salmon.	Grilse.	Salmon.	Grilse.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1864	..	..	..	..	..	..	..	..	..	..	5,302	5,220	6,835	7,507	12,137*	12,727*
1865	3,717	9,337	1,730	4,383	3,787	4,140	3,611	5,731	2,468	5,314	4,981	2,570	2,945	1,022	23,239	32,497
1866	2,106	6,598	893	3,377	2,340	6,943	1,747	5,977	1,905	8,776	3,437	5,348	2,281	2,884	14,709	39,903
1867	2,139	13,634	890	7,358	3,334	14,965	1,697	5,969	2,544	8,359	2,774	8,372	3,741	9,907	17,119	68,564
1868	2,365	4,653	1,942	3,210	3,908	2,421	1,995	1,777	3,395	3,395	8,135	1,025	9,135	860	30,875	17,341
1869	3,210	5,322	1,447	3,356	3,304	3,262	2,400	4,173	1,871	4,362	5,314	5,785	4,574	3,150	22,120	29,412
1870	1,585	5,328	1,135	3,100	2,953	4,901	1,211	2,805	2,396	2,756	5,348	6,095	5,061	4,914	19,689	29,899
1871	2,261	7,972	1,155	3,634	2,955	6,216	1,449	2,965	2,653	3,941	7,107	16,073	4,585	9,474	22,165	50,278
1872	Not fished.		826	2,786	3,700	8,067	862	1,970	Not fished.		7,046	5,386	8,768	3,677	21,202	21,886
1873	„		Not fished.		3,372	10,086	1,576	5,376	1,799	3,356	7,898	14,792	8,537	12,612	23,182	46,222
1874	„		„		5,977	18,771	4,189	15,705	2,250	9,434	7,485	7,473	19,840	6,262	39,741	57,645
1875	„		„		6,309	13,408	2,408	5,566	2,301	3,246	7,833	5,476	9,514	4,733	28,365	32,429
1876	„		„		5,076	10,137	1,273	3,944	1,894	6,031	5,116	22,167	6,583	12,449	19,992	54,728

* For Helmsdale and Brora only.

caught in the Duke of Sutherland's rivers, flowing into the Moray Firth and Pentland Firth, from 1864 to 1876.

Passing round Cape Wrath to the west coast of Sutherland, we find that all the rivers, without exception, are late—clean fish seldom appearing until May or June. The Laxford, Inver, and Kirkaig, all afford good angling.

Among the Ross-shire rivers, the Ewe, which issues from the beautiful Loch Maree, and is celebrated by Sir Humphry Davy in his '*Salmonia*,' is, perhaps, the best. The size and quality of its sea-trout are remarkable. In 1806, 579 sea-trout were captured, weighing no less than 1843 lbs., or an average of more than three pounds each. There are no district boards on any of the Ross-shire rivers.

The Garry, which flows through Loch Garry, and falls into Loch Oich, is the best spring river in Inverness-shire. Like the Ness, it is very early, and is remarkable, not only for the number, but for the weight of its salmon. Good, however, as the Garry is at present, it seems to have produced far more salmon seventy years ago than it now does; as we find from an article published in the 'Inverness Courier' in December last, and taken from a paper scroll-book, containing the business returns of salmon, grilse, and trout, caught in several of the principal rivers of Inverness-shire and Ross-shire, in the year 1806. That book contains a record of the fish sent from Glengarry between 11th February and 1st August 1806, from which we learn, that no fewer than 472

salmon, weighing 4890 lbs., were sent off during that period—the most productive months appearing to have been February and June, the former yielding 91 and the latter 120 fish.

But, all things considered, the Lochy, and its tributary the Spean, are decidedly the best angling rivers in Inverness-shire. The Lochy rises in Loch Lochy, and, after a course of about 8 miles, joins the sea at Loch Eil. The Spean issues from Loch Laggan, runs for 16 or 18 miles through scenery of varied and picturesque beauty, and unites with the Lochy at Mucomer. The pool formed by the junction of the two streams is probably the finest salmon pool in Scotland. Seventy salmon have been taken out of this pool in one month by a single rod; and, on Spean Bridge beat, one of the best beats in the Lochy, between Mucomer and the sea, from five to ten fish may be captured on a favourable day by one rod. The salmon on the Lochy and Spean run large; the average being about 15 lbs. On the little river Roy, which joins the Spean at Roy Bridge, very large fish—from 30 to 40 lbs.—are occasionally captured.

At the Falls of Mounessie, 7 miles above the junction of the Spean and Lochy, a perpendicular rock, 22 feet in height, prevents the ascent of salmon into the upper waters of the Spean; but here, as in the parallel case of the Falls of the Orrin, previously mentioned, I have ascertained by sounding, that the pool above the fall is 25 feet deep, and that only a comparatively narrow barrier of rock, which might easily be removed or lowered by blasting, intervenes between the pool above the fall and the river below. A short distance above Mounessie there is a fall, near

Inverlair Bridge, which, even if the rock at Mounessie were made passable, would probably prevent or impede the farther progress of ascending fish. But, if these obstacles were overcome, about 40 miles of rivers and lochs would be opened up for salmon.

South of the Lochy there are a good many salmon rivers and fishery districts, but in scarcely any of these have district boards been constituted—one great reason for this being, that many of them are too small to support a district board; so that power should be taken in any new Act to combine two or more of such districts into one. At present, the Shiel has no district board, and the Creran, the Etive, the Nell, Feochan, and Euchar, the Awe, the Laggan and Sorn, the Carradale, the Ruel, the Clyde, Leven, and Echaig, the Irvine and Garnock, the Ayr and Doon, are all likewise without district boards. The consequence is, that poaching, especially net-poaching, locally termed "scringing," is universal along the coast and among the islands of Argyleshire; the central point being the town of Oban, where thousands of sea-trout are annually caught by persons who have not a shadow of a right to fish for them, and openly landed and sold without any interruption or interference. Yet the Act 7 & 8 Vict. cap. 95, which was passed to prevent the destruction of salmon or fish of the salmon kind in the sea or shores thereof, provides "that if any person, not having a legal right or permission from the proprietor of the salmon fishery, shall, from and after the passing of this Act, wilfully take, fish for, or attempt to take, or aid or assist in taking, fishing for, or attempting to take in or from any river, stream, lake,

water, estuary, firth, sea-loch, creek, bay, or shore of the sea, within one mile of low-water mark, in Scotland, any salmon, grilse, sea-trout, whitling, or other fish of the salmon kind, such person shall forfeit and pay a sum not less than 10*s.*, and not exceeding 5*l.*, for each and every such offence." And the 25th section of the Salmon Fisheries Act of 1868, which amends the above Act, further provides that, "In order the better to carry out the provisions of the Act of the 7th and 8th years of Her present Majesty, chapter 95, it shall be lawful for any water-bailiff, constable, watcher, or officer of any district board, or any police officer, to search all boats, boat tackle, nets, or other engines, and all receptacles, whether at sea or on shore, which he or they may have reason to suspect may contain salmon captured in contravention of the said last-mentioned Act, and to seize all salmon found in the possession of persons not having a right to fish salmon, and the possession of such salmon shall be held *primâ facie* evidence of the purpose of the possession to contravene the provisions of the said last-mentioned Act." One could scarcely imagine anything more distinct and stringent than the above provisions; yet they have notoriously and utterly failed to put down, or even to check, "scringing," adding another to the many existing instances of the inefficiency of even the most stringent laws, unless adequate means are provided to enforce and make them respected.

There are district boards on most of the rivers on the Scottish shore of the Solway Firth; but the Cree, Bladenoch, and Urr, are without them. These rivers

are all late; the Nith being one of the latest in Scotland. The best angling streams among them are the Luce and the Annan. The Nith suffers considerably from pollutions at Dumfries, and the Dumfries dam or cauld, with one of the worst constructed salmon ladders in Scotland, is a very serious barrier to the free ascent of salmon. The gross annual value of the salmon caught in the rivers and districts, on the Scotch side of the Solway, is probably not under 7000*l.*

The following is a table of the open seasons for nets and rods on the English, Irish, and Scotch rivers. It is taken from 'Land and Water,' in which these useful tables are published annually:

ENGLAND.

Name of River.	Rods.	Nets.
AIRE, ALN, ARUN, AVON (Somerset), AYRON, BELLA, BRUE, CONISTON, DART, DEE, DERWENT, DERWENT (Yorkshire), DOVE, EDEN, ELLEN, ESK, EXE, FROME, HODDER, IRT, ITCHEN, KEER, KENT, LUNE, NIDD, OTTER, OUSE, PARRETT, PLYM, RHEIDOL, RIBBLE, SEVERN, SWALE, TAMAR, TAVY, TEES, TEIFY, TEIGN, TRENT, TYNE, URE, WHARFE, WANSBECK, WEAR, WINSTER, WYRE	Feb. 2 to Nov. 1	Feb. 2 to Aug. 31
AVON and STOUR (Hants)	Feb. 2 to Oct. 1	Feb. 2 to Aug. 14
AVON and ERME (Devon)	Mar. 31 to Nov. 21	Mar. 31 to Sept. 21
AXE	April 30 to Nov. 20	April 30 to Sept. 20

ENGLAND—*continued.*

Name of River.	Rods.	Nets.
CAMEL	April 30 to Nov. 15	April 30 to Oct. 1
CLEDDY	Mar. 15 to Nov. 21	Mar. 15 to Sept. 15
CLWDD and ELWY	May 15 to Nov. 15	May 15 to Sept. 15
CONWAY	May 1 to Nov. 14	May 1 to Sept. 14
COQUET	Mar. 25 to Nov. 15	Mar. 25 to Sept. 15
DOVEY	April 30 to Nov. 20	April 30 to Sept. 14
FOWEY	April 2 to Nov. 1	April 2 to Aug. 31
LEVEN, DUDDON	Feb. 2 to Aug. 31	Mar. 1 to Sept. 15
OGMORE	April 30 to Nov. 1	April 30 to Sept. 15
SEIONT, GWRFAI, LLYFNI	Mar. 1 to Nov. 15	Mar. 1 to Sept. 15
STOUR (Canterbury) ..	May 1 to Nov. 1	May 1 to Aug. 31
TAW and TORRIDGE ..	Mar. 31 to Nov. 16	April 30 to Sept. 16
WYE, TOWY, LOUGHOR, TAF	Mar. 16 to Nov. 1	Mar. 2 to Aug. 31
USK and EBBW	April 2 to Nov. 1	April 2 to Sept. 1

IRELAND.

Name of River.	Rods.	Tidal * Nets.
ANNAGASSAN	Feb. 1 to Aug. 31	Feb. 12 to Aug. 19
BALLISODARE	Feb. 1 to Sept. 30	Feb. 4 to Aug. 19
BALLYCASTLE	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
BALLYCROY RIVERS ..	Feb. 1 to Sept. 30	Feb. 16 to Aug. 31
BALLYNAHINCH	Feb. 1 to Oct. 15	Feb. 1 to Aug. 15
BANDON	Mar. 1 to Oct. 31	Mar. 1 to Aug. 15
BANN	Mar. 16 to Oct. 19	Feb. 4 to Aug. 19
BANTRY BAY RIVERS ..	Mar. 17 to Oct. 31	May 1 to Sept. 30
BARROW	Feb. 1 to Sept. 14	Feb. 16 to Aug. 31
BLACKWATER	Feb. 15 to Oct. 14	Feb. 15 to Aug. 14
BOYNE	Feb. 1 to Sept. 15	Feb. 12 to Aug. 19
BUNCRANA	Mar. 1 to Oct. 31	April 15 to Sept. 14
BUNDROWES	Jan. 1 to Sept. 30	Mar. 1 to Aug. 19
BURRISHOOLE	Feb. 1 to Sept. 30	Feb. 16 to Aug. 31
BUSH	Feb. 1 to Nov. 1	Feb. 4 to Aug. 9
CARRAGH	Jan. 16 to Sept. 31	Jan. 16 to July 31
CASHLA (Screebe)	Feb. 1 to Oct. 31	Feb. 1 to Aug. 15
CASHEEN	Mar. 16 to Sept. 30	June 1 to Aug. 31
DAWROS	Feb. 1 to Oct. 31	Feb. 16 to Aug. 31
DEE	Feb. 1 to Aug. 31	Feb. 12 to Aug. 19

* In a few instances in the following districts in Ireland the season for fresh-water netting differs from the tidal netting:—Dublin, Limerick, Ballina, Sligo, and Letterkenny.

IRELAND—*continued.*

Name of River.	Rods.	Tidal * Nets.
DOOHULLA	Feb. 1 to Oct. 31	Feb. 1 to Aug. 15
DOONBEG	May 1 to Sept. 15	June 1 to Sept. 15
EASK	Mar. 1 to Oct. 9	Mar. 1 to Aug. 19
EASKEY	June 1 to Sept. 30	June 1 to Aug. 31
ERIVE	Feb. 1 to Oct. 31	Feb. 16 to Aug. 31
ERNE	Mar. 1 to Sept. 30	Mar. 1 to Aug. 19
FANE	April 1 to Sept. 30	April 1 to Aug. 19
FERGUS	Feb. 1 to Sept. 30	Feb. 12 to July 31
FOYLE	Feb. 1 to Nov. 1	April 15 to Aug. 31
GALWAY	Feb. 1 to Oct. 15	Feb. 1 to Aug. 15
GLEN	Mar. 1 to Oct. 9	Mar. 1 to Aug. 19
GLENARM	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
GLENDUN	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
GLYDE	Feb. 1 to Aug. 31	Feb. 12 to Aug. 19
GWEEBARRA	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
GWEEDORE	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
ILEN	Mar. 17 to Oct. 31	May 1 to Sept. 30
INNY	Feb. 1 to Sept. 31	May 1 to Sept. 15
KENMARE BAY RIVERS ..	Feb. 2 to Oct. 31	April 1 to Sept. 15
LAUN	Jan. 16 to Sept. 30	Jan. 16 to July 31
LEANNAN	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
LEE	Feb. 15 to Oct. 14	Feb. 15 to Aug. 14
LIFFEY	Feb. 1 to Oct. 31	Feb. 1 to Aug. 15
LOUISBURGH	July 1 to Oct. 31	July 1 to Sept. 15
MAINE (Flesk)	Mar. 1 to Sept. 30	May 1 to Sept. 15
MOY	Feb. 1 to Sept. 15	Mar. 16 to Aug. 12
NEWPORT	May 1 to Sept. 30	May 1 to Aug. 31
NORE	Feb. 1 to Sept. 14	Feb. 16 to Aug. 31
OWENEA (Glenties) ..	Feb. 1 to Nov. 1	Feb. 4 to Aug. 19
PALMERSTON	June 1 to Sept. 30	June 1 to Aug. 31
ROE	Feb. 1 to Nov. 1	April 15 to Aug. 31
SHANNON	Feb. 1 to Sept. 30	Feb. 12 to July 31
SLANEY	Mar. 15 to Sept. 30	April 20 to Sept. 15
SLIGO	Jan. 1 to Sept. 30 (in tideway) Feb. 1 to Sept. 30 (fresh waters)	Jan. 1 to July 15
SUIR	Feb. 1 to Sept. 30	Feb. 1 to Aug. 15
WATERVILLE	Feb. 1 to Sept. 30	Jan. 1 to July 16

* In a few instances in the following districts in Ireland the season for fresh-water netting differs from the tidal netting:—Dublin, Limerick, Ballina, Sligo, and Letterkenny.

SCOTLAND.

Name of River.	Rods.	Nets.
THURSO	Jan. 11 to Sept. 14	
TWEED	Feb. 1 to Nov. 30	Feb. 15 to Sept. 14
TAY	Feb. 5 to Oct. 10	Feb. 5 to Aug. 21
ALINE, ALNESS, ANNAN, APPLECROSS, ARNISDALE, AWE, AYLORT, AYR, BAA, BADACHRO, BALGAY, BERRIEDALE,	Feb. 11 to Oct. 31	Feb. 11 to Aug. 26
BLADENOCH, BROOM, BRORA, CARRON, CLYDE and LEVEN, CONON, CREE, CREED (Stornoway), CREERAN, CROWE, DEE (Aberdeenshire), DEE (Kirkcudbright), DEVERON, DON, DOON, EWE FLEET (Sutherlandshire), FOSS, GLENELG, GOUR, GREISS, GRUDIE, GRUINARD, HALLADALE, HELMSDALE HOPE and POLLA, INCHARD, INVER, KENNART, KILCHOAN, KINLOCH, KIRKAIG, KISHORN, LAXFORD, LEVEN, LOCHY, LOCH DUICH, LOCH LUING, LOCH ROAG, LUSSA, MOIDART, MORAR, NAVER and BORGIE, FEOCHAN, ORMSARY, PENNYGOWN, RESORT, SANDA, SCADDLE, SHIEL, SLIGACHAN, SNIZORT, STRATHY, TORRIDON, ULLAPOOL, WICK	Feb. 11 to Oct. 31	Feb. 11 to Aug. 26
BEAULY, DUNBEATH, KYLE OF SUTHERLAND, LOSSIE NAIRN, NESS, SPEY	Feb. 11 to Oct. 15	Feb. 11 to Aug. 26

SCOTLAND—*continued.*

Name of River.	Rods.	Nets.
FORTH	Feb. 11 to Oct. 31	Feb. 11 to Aug. 26
FINDHORN	Feb. 11 to Oct. 10	Feb. 11 to Aug. 26
DRUMMACHLOY (Isle of Bute)	Feb. 16 to Oct. 15	Feb. 16 to Aug. 31
ADD, ECHAIG, NORTH ESK, SHIRA, SOUTH ESK, FYNE, ARAY, RUEL	Feb. 16 to Oct. 31	Feb. 16 to Aug. 31
BERVIE, CARRADALE, FLEET (Kirkcudbright), CLAYBURN, FINNIS BAY, AVENNANGEREN, STRATHGRAVAT, NORTH LACASTILE, SCALLADALE, MAWRIG, FINCASTILE, MEAVEG, BALLANACHIST, SOUTH LACASTILE, BORVE, OBB, GIRVAN, INNER, IORSA, IRVINE, LAGGAN, LUCE, STINCHAR, UGIE, MULLANAGEREN, HORASARY, LOCH NACISTE, URR, YTHAN, HOWMORE, NITH	Feb. 25 to Oct. 31	Feb. 25 to Sept. 9

Many of the lakes on the mainland of Scotland, and in the western islands, contain salmon and sea-trout. Loch Tay has been already mentioned. Next to it, probably, comes Loch Stack, which is let along with the Stack Deer Forest. It lies at the foot of the mountain of the same name, which, from certain points of view between Loch More and Scourie, looks exactly like the Matterhorn in miniature. The sea-trout in Loch Stack are remarkable for their size—running from 5 to 7 lbs. Two hundred pounds weight of sea-

trout have been killed on Loch Stack by a single rod on a favourable day. Loch Brora, Loch Naver, Loch Hope, Loch Shin, Loch Assynt, and many other Sutherlandshire lochs, yield salmon and sea-trout.

In the island of the Lews, the Grimersta lochs, the Blackwater lochs, Loch Cree, and Loch Laxa, abound in salmon and sea-trout; and so do Loch Scoorst, the Lacastile Lochs, the Obbe Lochs, and many others in Harris. The Grimersta fishings consist of four lochs, connected by a stream which flows from Loch Langevat, the largest lake in the Lews, and joins the sea at Loch Roag. They are among the most productive angling waters in Great Britain, as the following returns for the year 1873—a highly successful year—will prove. In seventy-nine days, beginning on 15th July, five rods captured with the fly 913 salmon, weighing 6304 lbs., and 1073 sea-trout, weighing 1073 lbs.; the average take for each of the five rods being thus, 182$\frac{3}{5}$ths salmon. During 1873, a single rod twice caught fifteen salmon in a day, and twice, thirteen. Twelve were once captured; and eleven and ten in a day six times respectively. Eighty salmon were taken previously to the 15th of July; so that the whole take of salmon for 1873 was 993. The best week in that year was the week beginning on 4th August, during which the five rods caught 126 salmon, weighing 840 lbs., and 176 sea-trout, weighing 133 lbs. The average weight of the salmon for the year was scarcely 7 lbs., and of the sea-trout a little over three-quarters of a pound. Only fifty-one fish of 10 lbs. and upwards were taken. The largest salmon was 20 lbs.; but the deficiency in weight was amply compensated by the numbers captured.

An interesting experiment was tried for several years at the Grimersta fishings, with regard to the effect of an artificial flood in inducing salmon to enter the river and lochs in dry weather. A dam and sluices were erected at the outlet of Loch Langevat—the great feeder of both lochs and river—and when the weather was dry, and the salmon and sea-trout collected at the head of Loch Roag were striving to reach the fresh water, but were unable to do so from the smallness of the river, the sluices were raised and the ponded-up water let down. The experiment was repeatedly tried, but always failed. Some inscrutable instinct enabled the salmon to discern, that even the water from this spring-fed mountain lake was different from a rain flood. They entered the river, indeed, but the water seemed soon to sicken them. The salmon retreated from the two lochs nearest Loch Langevat, from whence the ponded-up water issued, into the lower lakes, and but few fish were caught in them; while, in the two lochs farthest from the sluices, the fishing was rather improved. The gillies termed this artificial flood "rotten water." The result was, that the sluices were removed, and nature was left to do her own work unassisted.

The beautiful Loch Maree, Loch Garry, near the Caledonian Canal, Loch Morar, and Loch Eilt or Rannoch, all contain salmon and sea-trout. Till within the last ten or twelve years the fishing on this last-named loch was splendid, both salmon and sea-trout taking the fly freely; the former running from 10 to 18 lbs., and the latter from 5 to 8 lbs., though they have occasionally been killed as heavy as 15 lbs. In those days, from forty to fifty fish, chiefly large sea-trout, was not an un-

common take for one rod in a single day, in favourable weather. During the last ten or twelve years, however, the take has very much fallen off, both in numbers and in weight, from twelve to twenty fish a day being about the average, and the sea-trout seldom exceeding 3 lbs. This deterioration is said to be owing to the operation of the fixed nets on the coast near the mouth of the sea-loch, into which Loch Eilt discharges its waters through the little river Aylort. The sea-trout in Loch Eilt are excellent, but the salmon are decidedly inferior, even when fresh run; a rather singular circumstance, as the salmon in the Shiel, a little way to the south, and in the Morar, a little way to the north, are of very fine quality.

In Loch Shiel, a long narrow loch, that for more than 20 miles forms the boundary between Argyleshire and Inverness-shire, salmon and sea-trout are common, and I have repeatedly killed them both with minnow and fly—the salmon ranging from 8 to 16 lbs., and the sea-trout from 1 to 7 lbs. The mountain scenery around this loch, especially between Glenalladale and Glenfinnan, is of exquisite beauty. The upper part, however, requires a boat, as there is no road on either side. If the nets were taken off the short broad river that flows from Loch Shiel into the sea, and the estuary of the Shiel and Moidart enlarged by drawing a line from Ru Smirsiri to Ru Driminish, instead of the present more restricted estuary line, Loch Shiel might possibly come to rival Loch Tay in the number, if not in the weight, of its salmon. Besides, being a late loch, the salmon fishing on it would not commence until that on Loch Tay had ended.

It is extremely difficult to ascertain with certainty and accuracy the total annual value of the whole of the river and sea-coast salmon fisheries in Scotland. Regular and full returns can scarcely be expected where there are no Inspectors of Salmon Fisheries, no annual reports, and no district boards in the majority of the fishery districts. But, taking the estimate I have already given of the gross annual value of the salmon caught in the fifteen rivers and districts, from the Forth to the Conon, and adding thereto the value of the salmon taken in the hundred other rivers and districts in Scotland, I shall certainly not exceed the mark, if I reckon the whole at 250,000*l.* a year. A much higher value might, indeed, be assigned to the Scotch salmon fisheries on very plausible grounds. Thus, in Mr. Buckland's Report on the English Salmon Fisheries for 1876, we find a return given of the salmon sold at Billingsgate, from all quarters, from 1865 to 1875; and we learn from this that 30,181 boxes of salmon, averaging 112 lbs. each, were sent from Scotland in 1873, and 32,180 boxes in 1874. Taking the latter year, and reckoning each box at 10*l.*, this gives a sum of 321,800*l.* as the money value of the Scotch salmon sent *to the London market alone* in a single year; and assuming 12 lbs. as the average weight of the fish, we get the number of 300,346 salmon. In a letter from Mr. James Caird, Chief Commissioner appointed to investigate the state of the British fisheries, dated 31st March, 1868, and published in the late Mr. Thomas Ashworth's interesting little book on 'The Salmon Fisheries of England,' we find the

following estimate of the annual value of the river fisheries:

	£
England	30,000
Ireland	330,000
Scotland	200,000
Total	£560,000

Whereas, taking the value given in the last Reports of the English and Irish Inspectors, and adding the very moderate estimate I have ventured to make for Scotland, we find:

	£
England	100,000
Ireland	400,000
Scotland	250,000
Total	£750,000

The following table gives the number, weight, and value of the boxes of salmon sent to Billingsgate market from Scotland, and from other quarters, from 1834 to 1875, both years inclusive:

(Average weight of each Box 112 lbs.)

Year.	Scotch.	Irish.	Dutch.	Norway.	English and Welsh.	Total No. of Boxes.	Total Weight.	Total Value.
							tons	£
1834	30,650	350	..	..	..	31,000	1,550	173,600
1835	42,330	470	..	..	..	42,800	2,140	239,680
1836	24,570	430	..	..	..	25,000	1,250	140,000
1837	32,300	400	..	..	..	32,700	1,635	183,120
1838	21,400	900	None admitted.		No account kept.	22,300	1,115	124,880
1839	16,340	2,500	..	..	..	18,840	942	105,504
1840	15,160	4,570	..	..	..	19,734	986	110,510
1841	28,500	3,760	..	..	..	32,260	1,613	180,656
1842	39,417	4,490	..	..	..	43,907	2,180	245,879

Year.	Scotch.	Irish.	Dutch.	Norway.	English and Welsh.	Total No. of Boxes.	Total Weight.	Total Value.
							tons	£
1843	30,300	4,644	595	103	40	35,682	1,784	199,819
1844	28,178	4,248	269	None	None	32,964	1,648	184,598
1845	31,062	3,803	913	215	46	36,039	1,801	201,818
1846	25,510	5,214	849	100	41	31,714	1,585	177,598
1847	20,112	6,052	330	74	72	26,640	1,332	149,184
1848	22,525	4,373	1,148	67	48	28,161	1,408	157,701
1849	23,690	4,388	692	None	50	28,820	1,441	161,392
1850	13,940	2,135	105	54	72	16,306	815	91,313
1851	11,593	4,141	203	212	40	16,189	809	90,658
1852	13,044	3,602	176	306	20	17,149	857	96,034
1853	19,485	5,052	401	1,208	20	26,166	1,308	146,529
1854	23,194	6,333	345	None	128	30,000	1,500	168,000
1855	18,197	4,101	227	None	59	22,584	1,129	126,470
1856	15,438	6,568	68	5	200	22,279	1,113	124,762
1857	18,654	4,904	622	None	220	24,400	1,220	136,640
1858	21,564	6,429	913	19	499	29,484	1,474	165,110
1859	15,823	4,839	922	None	86	21,670	1,083	121,352
1860	15,870	3,803	849	40	438	21,000	1,050	117,600
1861	12,337	4,582	849	60	442	18,270	913	102,312
1862	22,796	7,841	568	87	454	31,746	1,587	177,777
1863	24,297	8,183	1,227	180	663	34,550	1,727	193,480
1864	22,603	8,344	1,204	837	752	33,740	1,687	188,944
1865	19,009	6,858	1,479	1,069	868	29,283	1,464	190,296
1866	21,725	9,326	1,772	1,632	1,563	36,018	1,801	218,521
1867	23,006	5,411	1,203	1,296	2,405	33,321	1,666	213,803
1868	28,020	3,487	1,725	807	407	34,446	1,732	233,084
1869	20,474	8,800	1,843	637	696	32,450	1,622	227,150
1870	20,648	9,211	3,120	626	852	34,457	1,722	213,059
1871	23,390	7,379	2,953	516	1,037	35,275	1,764	217,854
1872	24,404	5,298	1,380	952	1,316	33,300	1,665	..
1873	30,181	8,995	1,471	1,165	811	42,623	2,131	..
1874	32,180	6,041	1,602	1,491	652	41,966	2,098	..
1875	20,375	5,734	1,284	2,899	978	31,270	1,563	..

During the first seven years, in the above table, the average number of boxes of salmon sent from Scotland to London was 26,107; during the second period, 29,011; and during the third period, ending in 1854,

18,210; while, during the last period of seven years—from 1869 to 1875—the average number was 24,478. It is, perhaps, worth noticing, in connection with the above table, that the total number of boxes of salmon exported from Ireland in 1875, according to the statement of the Irish Inspectors—namely, 44,274½—exceeds the total number of boxes delivered at Billingsgate in any one of these forty-two years. In other words, Ireland, in 1875, produced more salmon than were consigned to London from all quarters, in any single year enumerated in the table.

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